NATIONAL PETROLEUM NEWS

World Regulation of Crude Needed, Petroleum Institute Is Told

Staff Special—By Telegraph
CHICAGO, Dec. 4

NECESSITY for world wide regulation of crude oil production to insure stability in all branches of our industry in this country, was brought out at the ninth meeting of the American Petroleum Institute here today.

Axtell J. Byles, president of the Tide Water Associated Oil Co., and vice president of the institute, brought up this point in his address opening the institute sessions this afternoon. He spoke in the absence of E. W. Clark, executive vice president of the Union Oil Co. of California, president of the institute.

"Cooperative efforts in restricting production of crude oil in this country cannot attain their maximum results unless similar steps are taken by the producers of foreign oil sold in competition with our domestic production," said Mr. Byles, in summing up that portion of his address dealing with the crude production situation.

"Present crude oil reserves, and those yet to be found instead of representing a threat will become one of the greatest stabilizing factors in the industry, provided they are properly developed, conserved and used."

The fact that Sir John Cadman, chairman of the Anglo-Persian Oil Co., England, was present as guest of honor of the institute and was to speak at its annual banquet on "Petroleum Problems outside the United States," was taken by oil men attending the institute meetings to indicate that the conferences on world production problems were to continue.

Sir John was a leader in the discussions on this subject which took place in Scotland last summer, which were attended by W. C. Teagle, president, Standard Oil Co. N. J., with other oil executives from this country.

Sir John brought to the meeting the point of view that some form of international cooperation must be found if the world resources of petroleum are to be developed with stability to the various national interests involved, regardless as to whether they are small or large in striking contrast to the meetings of the two years preceding.

Little attention was paid in the opening days of the Institute to the subject of legislation. The only thing that might properly come before the directors was approval or lack thereof of the bill drawn by the Committee of Nine, on which the institute has three members. That is the bill prepared for introduction in this session of Congress.

This bill is designed to grant certain exemption from the operation of anti-trust laws in controlling overproduction. Certain members of the directorate indicated at the beginning of the meeting that they doubted whether the matter would come before them at all. They took the position that the institute president merely named three men, complying with the request of the Secretary of the Interior, under whose auspices the bill was drawn and that it was not understood that it would be referred to the institute.

A companion effort to the move for federal legislation is the American Bar Association's initiating of steps to secure state laws to promote conservation. While this has no connection with the institute, the sub-committee named at a recent meeting in Wichita of the committee from the mineral section of the bar association, met in Chicago Dec. 1 to go over preliminary draft of the bill. It was the intention of the bar association committee to get this ready for introduction into state legislatures in January. There remains to be done considerable work on the draft between now and Dec. 15, when the full committee is to consider it.

On this subject also, the institute was to take no stand further than that taken last year when the directors voted approval of the general principle of state legislation to conserve gas pressure.

A SMALL committee set up last year to consider revision in present forms of oil and gas leases met Saturday and agreed that no uniform lease form could be drawn to meet all parts of the country.

A tentative form had been submitted last year by a sub-committee of three and during the year comment on this form was solicited.

New directors of the Institute elected at the meeting this afternoon are: H. M. Storey, Standard Oil Co. of California, Pacific coast groups; Axtell J. Byles, Tide Water Associated Oil Co., eastern production group; William E. Smith, Standard Oil Co. of Kentucky, eastern manufacturing group; L. L. Marcell, White Eagle Oil & Refining Co., central distribution group; John S. Carroll, Johns-Manville, Inc., supply group; D. J. Moran, Marland Oil Co., director-at-large.

TO PREPARE for you accurate and faithful, yet readable, accounts of the activities at the American Petroleum Institute meeting in Chicago this week, to interpret technical papers delivered and to analyze discussions at meetings, NATIONAL PETROLEUM NEWS *has the following staff in Chicago this week:*

Warren C. Platt, editor; V. B. Guthrie, managing editor; L. E. Smith and J. C. Chatfield, from its Tulsa editorial bureau; Paul Wagner, Houston, and Ward K. Halbert, Chicago.

Papers to be presented at the A. P. I. which report new developments in various phases of the oil business are to be found, many of them, in this issue of NATIONAL PETROLEUM NEWS. *Others will be carried in the next issue.*

Oil Men Make Up Section On Flying Oil and Fuel

By Ward K. Halbert
N. P. N. STAFF WRITER

CHICAGO, Dec. 3

A PERMANENT section on fuel and lubrication has been organized in the Aeronautical Chamber of Commerce of America. Most of the officers and all the members of important committees are oil men. The section was organized on Dec. 3 at the Stevens hotel, Chicago, where the A. C. C. is in convention coincidentally with the American Petroleum Institute.

Frank J. Shipman of The Texas Co., New York, is chairman of the section. John Proctor of the A. C. C. staff is secretary. There are six regional vice presidents as follows:

Sidney Bevin of Tide Water Oil Co., New York, for the eastern division; I. H. Shearer, Kendall Refining Co., Bradford, Penna., for the north central division; D. P. Barnard, Standard Oil Co. of Indiana, Chicago, for the Great Lakes division; F. L. Foster, Naturaline Co. of America, Tulsa, for the south central division; Dudley Steele, Richfield Oil Co., Los Angeles, for the southwestern division, and Emery Bronte, Associated Oil Co., San Francisco, for the northwestern division.

Discussion at the organization meeting centered around two main topics, fuel for high compression motors and lubrication for aviation motors. It was decided not to set up any technical or research laboratory and not to have anything corresponding to a committee on standards for fuel and lubrication, but rather to co-operate with existing organizations and their technical institutions.

The fuel committee consists of Capt. E. E. Aldrin, Standard Oil Co. of New Jersey, and F. L. Foster. The lubrication committee is composed of R. H. Mozier, Tide Water Oil Co., New York, and I. H. Shearer. Both committees were charged with special duties, as follows:

The fuel committee was instructed to keep in touch with research and developments in airplane fuel by the Society of Automotive Engineers, the Co-operative Fuel Research Steering committee, the Army, the Navy and any other agencies at work on the problem, and to keep the section advised of developments.

It was emphasized by several of the speakers that a number of the newer airplane motors of high compression can not operate efficiently on ordinary aviation fuel. They pointed out that fuel for such motors is not available everywhere and that distribution for it is a serious problem in practical flying.

The lubrication committee was instructed to "sell," if possible, motor manufacturers on the importance of agreeing on some standard of lubricating oil.

It was generally agreed that the matter of distribution of proper lubricants for airplane motors would be solved, once a workable set of standards was set up.

Mr. Shipman, chairman of the section, was instructed to make contact with the A. P. I. committee now trying to develop a code of marketing ethics, and try to inject into that code a few provisions to promote more simplified sales practices in the field of aviation fuel and lubrication.

Paul H. Bratten, Washington representative of the A. C. C., told the oil men of the existence of the chamber's office near the seat of government, its service in contracting government departments in the interest of aviation, and extended the courtesy of its service to the oil industry.

Fires at Sales Stations 7% of Industry Total

CHICAGO, Dec. 3.—Fires in bulk storage stations and filling stations of oil marketers comprise less than 25 per cent of the number of fires in which the oil business is involved, and represent only about 7 per cent of the industry's fire loss.

This information came to light at the Dec. 3 meeting of the fire prevention committee of the American Petroleum Institute, Chicago.

The figures are based in the Institute's fire record which has been kept since 1925. Only fires which involve a loss greater than $500 are included in the tabulation.

D. V. Stroop of the Institute's staff presided over the committee meeting and related how the organization came into possession of the data. A clippings service is employed to give leads on oil fires everywhere but no newspaper accounts are accepted as authentic information for the compilation. Only reports from the oil companies, submitted to the Institute are used in the official record. It was agreed that actual figures not be published in the Institute's bulletin, lest the remarkably good record lead to laxity.

A discussion of the suggested ordinance adopted in 1926 by the flammable liquids committee of the National Fire Prevention association, led to considerable controversy. In at least two respects, it developed, the proposed model ordinance affecting filling stations is out of date.

1. The ordinance permits of no gasoline tanks at filling stations larger than 2000 gallons, while in actual practice the tanks installed at new stations are larger than they were two years ago and the tendency is to use still larger ones. It is said that 10,000-gallon tanks at retail stations are not unusual and committee members think 20,000-gallon tanks may reasonably be expected in a few years.

2. While the ordinance prohibits the storage of gasoline in the same room with electric motors likely to spark, or with fires, it does not prohibit the storage of alcohol in such quarters. The committee voted to recommend changing the ordinance to prohibit storing alcohol in proximity to open fires.

The discussion closed with a vote to refer the ordinance to a sub-committee that the sub-committee be empowered to redraft the proposed model ordinance to present to the N. F. P. A. at its next meeting.

The sub-committee on vents, headed by H. H. Hall, chief engineer of Standard Oil Co. of California, was empowered to draft a recommendation of good practice for venting gasoline storage tanks.

Mr. Hall related the experience of his own company with regard to vents. Vertical tanks, when placed under excess pressure for any reason, ordinarily shear the top row of rivets and do little harm, he said. But horizontal tanks are more dangerous.

To safely vent horizontal tanks, the Standard of California has sheared all the threads on the manhole covers of all storage tanks. Under normal conditions the covers are heavy enough to function as if they were screwed on, but with the building up of excessive internal pressure, the manhole cover lifts without resistance, settling back into place.

Members of Committee D-2 Discuss Specifications

CHICAGO, Dec. 3.—Committee D-2 of the American Society for Testing Materials held a meeting here today in connection with the ninth annual meeting of the American Petroleum Institute.

The committee discussed with Dr. H. C. Dickinson of the Bureau of Standards and member of the U. S. Federal Specifications Board, contemplated changes in the government's gasoline specifications. Progress reports of some of the subcommittees also were presented. Dr. K. G. Mackenzie, The Texas Co., vice chairman, presided.

Continued Rationalization in 1929 Advised by Byles

CHICAGO, Dec. 4

CONTINUED, but extended rationalization, of production of crude oil and manufacture of refined products, and the elimination of uneconomic and unprofitable practices from the marketing of petroleum products was the program laid down for the industry in 1929 by Axtell J. Byles, president of the Tide Water Associated Oil Co., vice-president of the American Petroleum Institute.

Mr. Byles opened the general session of the institute this afternoon in the absence of E. W. Clark, its president.

In showing the need for continued restrictive operations of the industry, Mr. Byles said there was enough crude oil available to wreck the industry if produced. "At the present rate of production and imports we will make large additions to our overburdened storage of crude oil from November to April, inclusive, adding to existing heavy and uneconomic carrying charges," he said.

"The September, 1928, rate of gasoline supply, continued through 1929, would furnish an increase of 8.7 per cent over the 1928 gasoline consumption, and would be greater by two million barrels than a reasonable estimate of gasoline demand in 1929."

Mr. Byles gave the following figures as a forecast of crude oil and gasoline requirements in 1929. Assuming that next year's gasoline demand will be approximately 408,000,000 barrels, an increase of 8.2 per cent over 1928, this demand could be supplied from the following sources, he said, by cracking 142,000,000 barrels, from natural gasoline 37,000,000 barrels, from imports 10,000,000 barrels and from straight-run gasoline 219,000,000 barrels.

"To produce 219,000,000 barrels of straight-run gasoline, with a recovery factor of 24 per cent, which we believe to be conservative, would require 914,000,000 barrels of crude oil run to stills, or an average of 2,500,000 barrels a day," said Mr. Byles.

"We are now producing approximately this quantity of crude and importing 250,000 barrels, which would indicate that our present supply is more than would be required to meet the increased gasoline demand next year."

Cooperative efforts in restricting production of crude in this country cannot attain maximum results unless similar steps are taken by producers of foreign oil sold in competition without domestic production, said Mr. Byles. He said a serious situation might develop if congress, at its coming session, were to consider placing an import duty on foreign crude.

"Such action is within the realm of possibility unless, meanwhile, the industry generally has become convinced that the producers of Venezuelan crude oil are making, and will continue to make diligent efforts to restrict their production in harmony with the efforts being made in this country," he said.

As a means of preventing the overproduction of refined products in certain refining districts, with the consequent dumping of those products in the natural territory of other districts, Mr. Byles suggested the formation of associations in each of six or eight manufacturing districts in the country. These could hold production in balance with consumption within their natural transportation areas, he said.

In discussing marketing practices, Mr. Byles stated that the elimination of destructive and uneconomic practices would result in an increased return of from one to two cents a gallon on the 16 billion gallons of gasoline which will be delivered in 1928. "This return could accrue to the oil industry without increasing the cost of the product to the consumer," he said.

In concluding Mr. Byles expressed the opinion that rationalization of the industry could only be accomplished with the aid of some central or overall coordinating influence—an individual or a very small committee—which could command the confidence and respect, not only of the oil industry, but the government and public also.

Prejudices Delay Use in Fields Of A.P.I. Standard Material

CHICAGO, Dec. 4

THE active support of oil company executives in bringing standardized oil field materials into greater actual field use was urged by W. G. Skelly, head of the Skelly Oil Co., Tulsa, speaking before the American Petroleum Institute at its general session here today. Mr. Skelly's subject was, "Value of Standardized Oil Field Equipment."

While the standardization program of the institute, after years of effort, is now 90 per cent completed, the oil producing industry is not enjoying to the full the economies that might result from that work, because of its slowness in using the standardized equipment, Mr. Skelly said.

He gave as the reason the prejudices of field men who had not taken part in the drawing up of standards and specifications, and who are now opposing the introduction of equipment which differs from that which they have used before. He said oil company executives were being swayed by the prejudices of these field men.

"If your companies are not users of A. P. I. standard material, it is either because of your own lukewarm, indifferent attitude in the matter, or because your field men, for some reason or other, are opposing its adoption," he said. "It is time for you either to adopt the standard equipment, with its acknowledged benefits and economies, or else be furnished with sound engineering arguments against its adoption.

"If your staffs can present such arguments they will be weighed at once by the standardization committees."

Mr. Skelly enumerated the great advantages of standardized oil field material as: increased safety in handling strings of casing made possible by the elimination of so many varieties of pipe thread, together with elimination of fishing jobs and delays; the interchangeability of parts, and the reduction in investment in materials and equipment for both operators and manufacturers.

"The oil industry is confronted with the absolute necessity of economizing in every possible direction," Mr. Skelly concluded. "We owe it to ourselves, to our stockholders, and to our industry to put the oil business on an economical, safe, and sound basis.

"We owe it to the small operator (who usually follows the practice of the larger operator), who lacks all of these technical and practical facilities, to make them available to him by endorsing, through actual usage, these A. P. I. standards.

"We have often been accused of being wasteful and profligate in our operations. In the immediate adoption of our Institute's standardization in the purchasing of our future supplies and equipment, we have one of our best opportunities to help make any such accusation in the future an unjustified one, and at the same time benefit ourselves tremendously.

"The board of directors, in the early days of the Institute, very wisely provided the machinery for the formulation and adoption of these standards

and codes. Standardization is but one of the Institute's many activities that we can utilize to our lasting advantage, but it is a highly important activity, the results of which are now at our hands if we but reach out and avail ourselves of the opportunity.

"Every executive in the oil industry owes it to himself and to his company to properly inform himself on what the Institute is doing in its Standardization Division, and to make these specifications and codes available to everyone in his company who has anything to do with purchasing of material, or with the drilling and production of oil."

Discuss Vapor Pressure Testing Methods

CHICAGO, Dec. 3.—The committee on vapor pressure of the American Petroleum Institute met here Dec. 1 in joint session with representatives of the Natural Gasoline Association of America, the Bureau of Explosives of the American Railway Association and the California Natural gasoline association, to discuss the proposal of the Bureau of Explosives that a change be made in determining the vapor pressure of gasoline.

The Bureau of Explosives is interested in the matter in connection with the formulation of rules for the safe shipping of gasoline. The Bureau is suggesting that the present method be replaced by some method that will give substantially the true vapor pressure.

Two such methods are now available, the Beistle and Prather method and the Reid method, the latter having been already adopted for specification purposes by the Natural Gasoline Association of America. The representatives of our industry approved the substitution of the Reid method for the present method of the bureau provided this does not disturb appreciably present practice in the shipment of gasoline either in the ordinary or in the insulated tank car.

This means that a change in the vapor pressure limit for both classes of cars must be made since the true vapor pressure of gasoline is quite different from that obtained through the use of the present Bureau of Explosives method.

To determine what these new limits should be, three committees were appointed from different sections of the country to make comparative tests with the present bureau of explosives method, the Beistle and Prather method and the Reid method on samples that approach the upper limit of vapor pressure for both the ordinary and the insulated car. The chairmen of these committees are: C. A. Neusbaum, The Standard Oil Co. of New Jersey for the eastern district; G. G. Oberfell of the Phillips Petroleum Co. for the Mid-Continent district; and P. S. Magruder of the General Petroleum Corp. for the Pacific coast district.

The proposed change in the vapor pressure requirements of the Bureau of Explosives for the shipment of gasoline is of interest to the entire petroleum industry and anyone who desires to cooperate in these comparative tests should get in touch directly with the chairman of the appropriate district committee, Dr. R. P. Anderson, technologist of the Institute, states.

Ten Day Time Limit for Reconsignment Sought

CHICAGO, Dec. 3.—A time limit within which tank cars of petroleum products may be diverted or reconsigned will be sought by the railroads according to a report to the general committee on railroad transportation made today by B. J. Burchett, traffic manager for the Shaffer Oil & Refining Co. The carriers will demand the change it was said, because of the fact that in certain cases unduly long intervals have been allowed before reconsignment after cars have been refused.

The rule is aimed also at the practice of shipping refined products to certain markets before the goods have been sold. In such cases the shippers hope to find a customer while the cars are enroute but sometimes fail in their purpose.

The American Petroleum Institute committee voted to ask a period of 10 days from date of notification by the carrier that the consignee has refused to accept the shipment or has failed to claim the shipment. It was pointed out that such a period is necessary to permit tests of refused shipments when buyers allege that the cars are not up to specification.

The committee also will insist that the railroads observe the rule that wire notice be sent to shippers when cars are refused.

Report was made that the railroads will seek to require the industry to inspect cars of petroleum products which are not considered dangerous while they are still in the yards or on public team tracks. Since the Interstate Commerce Commission ruled that all petroleum product shipments may be inspected on private sidings and later reconsigned on a through rate, the committee voted to stand on that order.

Unreasonable delays on the part of railroads in repairing tank cars found in bad order en-route came in for criticism by the traffic managers. It was agreed that a committee from the industry work with a committee of the American Railway Association to reduce these delays and seek to cut down unfair claims of shippers for time lost by cars being repaired.

A sub-committee was authorized to study proposed revisions in the rules of the Bureau of Explosives covering the transportation of petroleum and its products. Fayette B. Dow presided as chairman of the general committee. He was appointed recently to succeed W. R. Boyd, Jr., whose duties have grown too large to permit further work with the group.

Refinements Made in A.P.I. Standards

CHICAGO, Dec. 3.—With the exception of the committee meeting on standardization of wire rope and manila cordage, the discussion in standardization meetings on the opening day of the American Petroleum Institute was confined to minor changes in specifications whose necessity has been shown by field use of the equipment.

The discussion on wire rope centered on the study and report that has been made by the Mid-Continent Engineering Sub-committee. Independently of other regional sub-committees or the main committee on wire rope standardization, this little group has carried on investigations over the past year, testing hundreds of specimens of wire line.

In outline, its findings were reported in November at Tulsa in the meeting of the A.P.I. division of development and production engineering, Mid-Continent section. (See NATIONAL PETROLEUM NEWS, Nov. 28.) Material presented in Chicago included the revision of specifications heretofore adopted, such revisions being the view of the Mid-Continent sub-committee.

The report, after considerable discussion, was adopted for study over the next year. In other words, the rest of the body that has been at work on this subject is given a year to prove that the Mid-Continent subcommittee is wrong. It defended its position stoutly, backing its assertions by records of the detailed research it has conducted. It insists upon examination of wire rope by the purchaser before acceptance and it also insists equally upon proper care of the wire rope after it is put into service.

The tubular goods committee was presented a report from the Standard Development Co., dealing with special tests made on a group order of 8-inch A.P.I. specification line pipe. This report stated the finding that the claim is not substantiated that high phosphorous pipe gives better welding qualities than low phosphorous pipe. The report also indicated that of the two types the discard in rephosphorized pipe is greatest.

The manufacturers' sub-committee on belting standardization submitted changes in proposed specifications that were designed to protect trade secrets; also changes considered more workable in handling the details of any tests that might affect service adjustments.

West Texas Capable of Underbidding Any Other Producing District

Staff Special
CHICAGO, Dec. 5

FLUSH producing areas in west Texas probably could underbid and undersell any other producing district in America, north or south, according to J. Elmer Thomas of Fort Worth in his Institute paper discussing crude oil curtailment.

Producers in these areas have no incentive, he pointed out, to market their "one time crop" at bankrupt prices; their proper portion of the total consumptive demand is not an agitated issue. He made the point that west Texas operators merely expect a sufficient outlet for their production to yield a living income.

Mr. Thomas denied the widely held opinion that, whatever production west Texas is capable of making, the current output represents all the oil that can be moved from the territory.

"This idea is erroneous," he said, "since about 100,000 barrels per day more oil could be moved out of west Texas with the present facilities.

"The trunk pipeline outlet last summer was 225,000 barrels. An additional 125,000 barrels daily is already assured before next summer and any further disparity in the posted price for this crude as against any other competitive crude will encourage the construction of additional pipelines.

"These lines when built certainly will be utilized and that much additional output will demand a market or will supplant a market now being supplied elsewhere.

"Far from feeling that the stability of west Texas production is assured, the writer believes that the demand for that oil at the present crude price levels, or ratios, is the most serious threat to the maintenance of proration in Texas."

In summing up his discussion of the history of Texas prorating and its present economic ramifications, Mr. Thomas says:

"Proration in Texas was dictated by necessity; it was worked out by expediency. Great benefits have resulted to the industry; certain hardships have been borne by some operators. Much has been accomplished in the past; still more must be undertaken in the future.

"Advanced to its logical conclusion there must be a proration as between prorated areas. The consumptive demand must be shared. This is not a problem for Texas alone. It involves the entire United States and finally the whole world.

"A more general understanding of the true situation in Texas should force these greater considerations. Texas could ship an additional 100,000 barrels daily beginning by tomorrow, by next spring perhaps another 100,000 barrels daily and by the end of next year possibly another.

"Proration is an artificial device resorted to when unusual conditions prevent the natural, customary methods of oil production. Primarily it must be legal; ultimately it should be fair and reasonable. It may be postulated that the most equitable basis of proration will effect a withdrawal of oil relatively comparable in amount to what would have taken place if no restrictions had been necessary. In other words, only the time element should be altered. In this way the volume of production can be adjusted to the volume of consumption and the output will thus keep in step with demand.

"Such a basis of proration can be predicated neither on the size nor location of lease tracts, nor on the potential production indicated by initial gauges, nor upon natural flow restricted to obtain any arbitrarily selected gas-oil ratio. It should be pointed toward permitting withdrawals which would finally effect the same ultimate recovery from each tract that would have resulted from the free and untrammeled development of the field.

"Obviously, if the exact amount of oil underlying any given lease tract could be computed in advance of development, it would be a simple matter to arrange crude withdrawals which would finally result in approximating such yields. On the contrary, no one would attempt to make such estimates and therefore the accepted version of fairness under proration hangs upon the ideas and opinions of technologists as to what extent such artificial regulations will have altered normal results. The truth can never be known and any acceptable formula, therefore, must be the result of compromise. For this reason it seems more desirable to develop a method of proration as a result of mutual agreement by the operators concerned in any particular field than as a result of fixed governmental regulation.

"The experience in Texas and also in Oklahoma during the past year, however, has shown that in most cases the majority of operators in any area could agree upon a satisfactory plan. Such a majority, however, has had no power to place their regulations in effect and a minority of only one was therefore sufficient to prevent the adoption of a program which appeared to offer the greatest good to the greatest number.

"For this reason it seems desirable that such authority in each state be vested in some conservation commission, or other regulatory body. The writer offers the further thought that such a body should have no power to initiate such regulations, but rather, after receiving applications from the majority of operators, to promulgate certain rules and after conducting hearings to establish the necessity and fairness of such regulations, they should be enabled to administer and enforce the program recommended."

Urge Directors to Create Technology Division

CHICAGO, Dec. 3.—Members of the general committee on refinery technology of the American Petroleum Institute, adopted a resolution at a meeting held this afternoon, recommending to the board of directors of the Institute that they create a permanent division of refinery technology to provide a forum for the presentation of papers on topics of mutual interest and for free discussion of such topics.

E. W. Isom, Sinclair Refining Co., chairman of the general committee, presided at the meeting. He asserted that the present committee which was appointed Feb. 1, 1928, goes out of existence with this meeting and recommended that the work of the committee be carried on by a permanent organization. He stated that it was realized that the appointment of the committee was a temporary measure.

Chairman Isom was empowered by vote of the committee to name a nominating committee of three members to recommend to the Institute directors the names of men regarded as eligible for officers of the new division. The directors are expected to act on the resolution during the meeting.

Atlantic Refining Adopts New Gasoline Price Structure

CLEVELAND, Dec. 4

A NEW gasoline pricing structure was put into effect Dec. 3 by the Atlantic Refining Co. in Pennsylvania and Delaware in an effort to stabilize tank wagon and service station markets in those states. Several major distributors in Pennsylvania have already announced they would follow the Atlantic's lead.

The Atlantic has two basic open market prices, the service station price and the tank wagon price. The posted prices at present are 20 cents service station and 19 cents tank wagon price, including 3 cents tax. However, discounts are allowed off the posted open market prices to both dealers and large commercial accounts.

The dealers get 3 cents off the posted service station price, regardless of quantity bought. The commercial account that contracts to buy 5000 to 10,000 gallons of gasoline a year will be given a discount of 1 cent off the service station price when the gasoline is delivered at a service station. If the commercial account contracts to buy 10,000 to 50,000 or more gallons of gasoline a year it gets 2 cents off the service station price.

Any tank wagon deliveries up to 5000 gallons a year will pay the open market tank wagon price which is 1 cent a gallon less than the service station price. A commercial account that contracts to buy 5000 to 10,000 gallons of gasoline a year will get 2 cents off the service station price when the delivery is by tank wagon. If it contracts to buy 10,000 gallons or more a year and gets the gasoline by tank wagon it will get 3 cents off the posted service station price or at the same price at which the dealer gets his tank wagon deliveries from the jobber or refiner.

Some Independent distributors in western Pennsylvania today said they were a bit skeptical about the outcome of the commercial accounts. It was pointed out that a commercial account might represent that it would add one or more trucks to its fleet next year and use a volume of gasoline that would get one of the larger discounts but that actually it would consume less gasoline than the minimum amount required for the particular discount granted. During the year it would be receiving the larger discount but would not earn it.

Dealers who have been receiving a discount of 4 cents off the service station price have already protested against the cutting down of their margin by 1 cent a gallon. It was pointed out by one large distributor that if the major companies adhere to the schedule posted by the Atlantic that it would not cost any of the distributors any dealer accounts because they could not better themselves by buying from another source of supply.

So far as commercial accounts are concerned a great improvement in the tank wagon and service station markets is expected. While courtesy cards carrying 2 or more cents a gallon discount have generally been discontinued some of the large commercial consumers of gasoline have had contracts which in a few cases have amounted to a little more than tank car prices for deliveries by tank wagon. When these contracts expire, most of them Dec. 31, it is said to be the plan to hold them to the new price structure.

The Atlantic Refining Co. is the fourth large company to adopt in the last two or three months a new gasoline market structure in an effort to rectify the bad conditions that were brought about by the overproduction of gasoline in recent years and the sharp competition for outlets. The Atlantic's structure differs from those of the other companies.

The Standard Oil Co. of Indiana placed its quantity discount agreements on a service station basis and eliminated discounts from the tank wagon prices. This tended to end many of the discounts that had been granted many small consumers. A consumer has to buy 500 gallons a month to get a 2-cent discount from the service station price like dealers get.

The Standard Oil Co. of Ohio has a basic service station price. Consumers that receive tank wagon deliveries get 1 cent off the posted service station price and dealers get 3 cents off the service station price. No quantity discounts are granted.

The Standard Oil Co. of New Jersey bases its market on method of delivery with the tank wagon market to either dealers or consumers 3 cents under the service station price. No discount is granted at the service station; the price is flat.

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(By Telegraph)

CHICAGO, Dec. 4.—R. D. Leonard, vice-president, Atlantic Refining Co., who is attending the American Petroleum Institute meeting here, explained today the new price structure of his company as follows:

Taking Boston for example: The current retail price is 17 cents. In addition to that there is a special tank wagon price to dealers which is now 14 cents, allowing dealers a spread of 3 cents. There is also a special contract arrangement for commercial accounts. Large consumers contracting with the Atlantic Refining Co. to use between 5000 and 10,000 gallons of gasoline a year are made a price concession of 1 cent. Those contracting to use 10,000 or more gallons a year get a price concession of 2 cents.

If these commercial accounts buy their gasoline from service stations their price concessions are figured off the service station price and if they enjoy tank wagon service, their price concessions are figured off the regular tank wagon price. There are no special concessions to dealers based on the volume of purchases.

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CLEVELAND, Dec. 4.—From the foregoing statement of R. D. Leonard it would seem that the Atlantic's new price structure applies to its New England market as well as to Pennsylvania and Delaware. His explanation differs from the understanding of the structure by Pennsylvania distributors in one detail: the Pennsylvanians figured both service station and tank wagon concessions from the service station price, the concession for tank wagon deliveries being 1 cent more off the station price than service station discounts off the service station price.

Index to Coming Meetings

Wisconsin Petroleum Association, Schroeder Hotel, Milwaukee, Dec. 12.

Petroleum Accountants Society, Mayo Hotel, Tulsa, Okla., Dec. 13.

Oklahoma Oil Jobbers Association, Oklahoma City, Okla., Jan. 24, 25.

Wisconsin Petroleum Association: Park Hotel, Madison, Jan. 16 and Feb. 13; Schroeder Hotel, Milwaukee, March 13 and Apr. 10; Beaumont Hotel, Green Bay, May 15.

American Oil Men's Association, Congress Hotel, Chicago, Feb. 12, 13, 14.

***Ohio Petroleum Marketers Association, Hotel Statler, Cleveland, O., Feb. 13, 14, 15.**

Iowa Independent Oil Men's Association, Fort Des Moines Hotel, Des Moines, Ia., Feb. 19, 20.

American Association of Petroleum Geologists, Fort Worth, March 21, 22, 23.

***This changed from Neil House, Columbus to Hotel Statler, Cleveland.**

Injunction Suits May End Truck Tank Monopoly in New York

NEW YORK, Dec. 3

LEGAL action is proceeding to end the gasoline truck tank monopoly in New York City. The Smith-Hamburg-Scott Welding Co. has been granted a temporary injunction restraining the Kenny controlled Tank & Accessories Corp. from selling the Columbian tank on which it has a monopoly. A hearing on a plea for a permanent injunction will be held Dec. 6.

The Smith-Hamburg-Scott company also has pending another action, filed last week, in which it asked that the New York fire department be ordered to grant a permit to that company to sell its tank for use in New York.

The filing of the injunction suit and the mandamus action followed conferences between New York officials and Congressman John J. O'Connor, attorney for the welding company, which began the day after election. The suits are said to be friendly actions, which probably means that approval will be won by the Smith-Hamburg-Scott company, the court passing mainly on the legality of the New York tank specifications which that company alleges are drawn about a patented article contrary to Sec. 1554-A of the city's ordinances which prohibits compulsory use of patented articles.

The use of a patented cab for tank trucks also is attacked by the welding company. The present cab specifications are alleged to be built around the Highland cab for which William F. Kenny, chief backer of Governor Alfred E. Smith in his presidential race, and his brother, James A. Kenny, are the sole agents. The Tank & Accessories Corp. is the Kenny selling organization.

The patented feature of the Columbian tank which is incorporated in the New York specifications for gasoline truck tanks, is the extension of the bulkheads of the tank beyond the shell. The Smith-Hamburg-Scott company lapwelds the bulkheads inside a one piece shell, making a joint which, it claims, is stronger than the shell itself.

It is generally talked in oil and tank circles in New York that the Kennys bought the agencies for the Columbian tank and the Highland cab shortly after New York permitted the bulk delivery of gasoline early in 1925. It is said they first sought to get a monopoly on the delivery of gasoline, but the large oil companies would not agree to this. The Tank & Accessories Corp. was then formed and a monopoly for the tank and cab were obtained by having included in the tank and cab regulations features which were covered only by the tanks and cabs for which the Kennys were agents.

If the court holds the regulations to be illegal because the specifications can be met with only patented articles, the way will be opened for the manufacturer of any tank or cab that meets fully the safety requirements to sue the New York fire department for recognition.

Politics is believed to have entered into the willingness of the New York officials to stand suit by the Smith-Hamburg-Scott company. The holders of the monopoly have been of the Smith faction of Tammany Hall. Tammany rides no "dead horses," so when Governor Smith failed to carry his state and even failed to carry New York City with as large a plurality as Tammany had expected, Tammany was willing to mount a new steed which happens to be the one in power in City Hall—the Walker faction.

After Walker became mayor less than a year after the Kennys got their monopoly in 1925, an effort was made to alter the truck tank specifications to permit delivery of gasoline in tanks with gravity discharges. Walker appointed a committee to draft new specifications but when this committee was ready to report on changes, it was informed by fire department officials that no changes would be made.

It is doubtful now that the gravity discharge tank will be permitted in place of the present required syphon discharge. The city government is backed up by the New York Board of Fire Underwriters in the demand for only syphon discharge. This is because of the unusual fire hazards New York City presents—trolley wires in slots under the street, three and four levels of subway and railroad tracks at several points, elevated railway standards, and the world's worst traffic congestion.

The hearing Dec. 6 will be before Justice Wasservogel of the Supreme Court of New York County who granted the temporary injunction prohibiting the sale of Columbian tanks and Highland cabs as a monopoly. If the tank and cab fields are thrown open by the court these pieces of equipment will be allowed to compete just the same as other articles which may get the New York fire department's approval.

Only about 200 tanks have been sold in more than three years the city has permitted bulk delivery of gasoline. It is estimated that with the field well opened that the number will rise to 2000.

Chicago Station Owners Fight License Fee

CHICAGO, Nov. 30.—Inspired perhaps by recent favorable judicial decisions in Minneapolis and in Blue Island, Ill., preventing those municipalities from exacting large license fees for revenue from oil stations, the station owners of Chicago are appealing to the courts for similar relief.

Paul Fliegelman and Leonard Micon, proprietors of a filling station at 7602 South Ashland Avenue, on behalf of all the other filling station owners of Chicago, filed a petition on Nov. 30, through their attorney, Samuel Micon, asking an injunction to restrain the city of Chicago from collecting its annual license fee.

The plaintiffs, Fliegelman and Micon, are officials of The Filling Station Owners Association of Cook County, Illinois. The attorney, Samuel Micon, is the father of Leonard Micon. The case was filed in the Circuit Court on Nov. 30 and was assigned to Judge Fisher's court where the motion to issue the injunction will be made on Tuesday, Dec. 4.

In Blue Island, a Chicago suburb, and in Minneapolis, the license fee was $100 per year for each station. The Chicago ordinance is different. It does not exact a flat fee but charges graduated fees, based on the amount of storage at any given station. The fee is not less than $50 a year and often exceeds $100, it is said—the average fee being about $75 a year.

This case probably will be fought on the same grounds as those successful cases mentioned before. They were discussed in NATIONAL PETROLEUM NEWS, issues of Oct. 24 and Nov. 7.

Grounds upon which Attorney Micon asked an injunction are four in number and briefly are as follows:

That the license fee is exorbitant; larger than that paid by any other business in town and therefore levied by class legislation.

That it is a revenue measure, really a tax and not a license fee. Mr. Micon will argue that a license fee for any legitimate business should not be larger than the cost of issuing it. He estimates the cost at approximately 50 cents a year and maintains that the filling station business is, in every sense, legitimate; that it is essential to public convenience and not likely to deteriorate into a nuisance.

That the fee does not pay for any special service that the oil men receive from the city, for they actually receive no more police protection or supervision than any of the other less taxed lines of business.

That the fee is not for inspection of their plants nor their products for inspection fees are paid under another ordinance by all the plaintiffs.

This home of W. V. Kidder in La Crosse, Wis., used 4105 gallons of light fuel oil last winter in heating the house and garage which is attached to the house at the left. This house was above the average as a furnace oil market

This bungalow home of J. I. Lamb in La Crosse, Wis., burned 1411 gallons of furnace oil last season. There are thousands of similar small homes in this country which are live oil heating prospects and to which the oil companies may help sell burners

How Heating Oil Distributors May Gage Size of Their Own Markets

By Roger B. Stafford
N. P. N. STAFF WRITER

Article 2

CLEVELAND, Dec. 3

THE oil marketer who is engaged in supplying oil for home heating or one who contemplates entering this field, the most rapidly growing of the applications of oil for heat generation, may easily estimate the present demand in his field and gage the growth of future demand perhaps months in advance of a heating season.

This estimate or forecast may be made by getting from the burner distributors the number of burners already installed or to be installed in the territory in which the oil man wishes to distribute oil for home heating, and setting down some proportion of the consumers which he believes he should serve. He may then go about estimating the volume of oil his part of the market will demand.

According to the Oil Burning Institute the average mechanical domestic type burner supplying automatic heat consumes an average of 60 barrels of oil a season. This is approximately 2500 gallons. The average natural draft burner, manually or semi-automatically operated, burns an average of 40 barrels a season. This is approximately 1700 gallons a season.

Of course, many factors enter into the volume of oil consumed but these factors can be considered by the oil man when he makes his survey of the potential market and the average for his particular community may be raised or lowered according to his findings.

The climate and type of residence construction are perhaps the most important factors. A burner in Minneapolis will consume more oil than one in Atlanta if each is installed in the same type and size of house. A burner in an uninsulated frame house of eight rooms will consume more oil than one in a solid brick or brick veneer on tile house of the same size.

Some people may keep their houses heated to 75 degrees Fahr. day and night while others may heat theirs to only 70 degrees days and 55 degrees nights. These factors can be ascertained from the home owner, often by an office clerk using the telephone.

Metal weather strips, some heating authorities say, may cut the volume of oil required as much as 7 per cent from the volume burned when the house is not weather-stripped.

A burner that is efficient in one type of heating plant may not be successful in another type of heating plant. For example, a slow burning oil flame is more economical in a heating plant in which the hot gases have only a short travel to the flue, than a violent flame which requires a longer distance to the flue unless the owner is willing to let a large part of his B.t.u. go up the chimney. Where the hot gas passage is long the slow flame may be insufficient to boil the water or bring a hot water system up to the desired temperature.

Due allowances should be made for both physical and personal factors when an estimate is made of a potential market.

The owner of the large uninsulated house may be the best furnace oil customer from point of volume but he may complain when his heating bills mount. If the oil man is familiar with the type of construction, the habits of his customer, he may often forestall criticisms about the economy of heating with oil. However, most oil users are so pleased with oil heating, particularly when it is automatic, that complaints are few, most oil companies report.

After home heating oils have been marketed one season the oil man should know just about what volume of oil will be needed each season. In other words, he has a good yardstick to measure his market.

IN ESTIMATING the needs of large burner installations the 40 and 60-barrel approximate will not do. Some other measure is necessary but in those large installations there usually is an attendant for the heating plant who will watch the supply of oil on hand more closely than the average home owner and can order oil as it is needed. However, if the oil man wishes to estimate his purchases from his refinery source of supply, he may get an approximate fig-

ure of probable demand over a heating season by using the square feet of radiation as an index.

An index which is used by the distributors of the Hardinge burners in Chicago is that four gallons of oil are required for each square foot of steam radiation over a heating season and three and a half gallons of oil for each square foot of hot water radiation. This company had no gage for hot air installations.

Statistics on how home heating with oil has been growing are being presented this week before the American Petroleum Institute by Trell W. Yocum, director of the Oil Heating Institute. Table 1, prepared by Mr. Yocum from figures obtained by the U. S. Bureau of Mines in a survey of fuel oil consumption, shows the estimated consumption of fuel and gas oils and distillates in the last seven heating seasons, and the probable consumption in the 1928-1929 and the 1929-1930 seasons. Table 2 shows the number of domestic type oil burners that were in operation at the beginning of each year from 1921 and including an estimate of the number that will be in operation at the beginning of next year.

Mr. Yocum also presented statistics on the number of commercial type burners in operation the last four years. By commercial types he meant burners used for heating large apartment houses, theaters, churches, hospitals, schools, office buildings and similar structures.

There is estimated to be 33,550 burners of this type in operation this winter, a gain of 3250 over the number of installations in operation last winter. These 33,550 burners will consume, it is estimated by the Oil Heating Institute, 16,750,000 barrels of oil, a volume just a trifle less than the volume that will be consumed in heating homes this winter.

The commercial type burner usually takes a heavier oil than the domestic type; often the commercial type takes the heaviest grades, which must be heated before delivery. Deliveries to commercial burners many times are as much as 2000 to 4000 gallons. Seldom is a delivery less than 1000 gallons unless the oil marketer desires

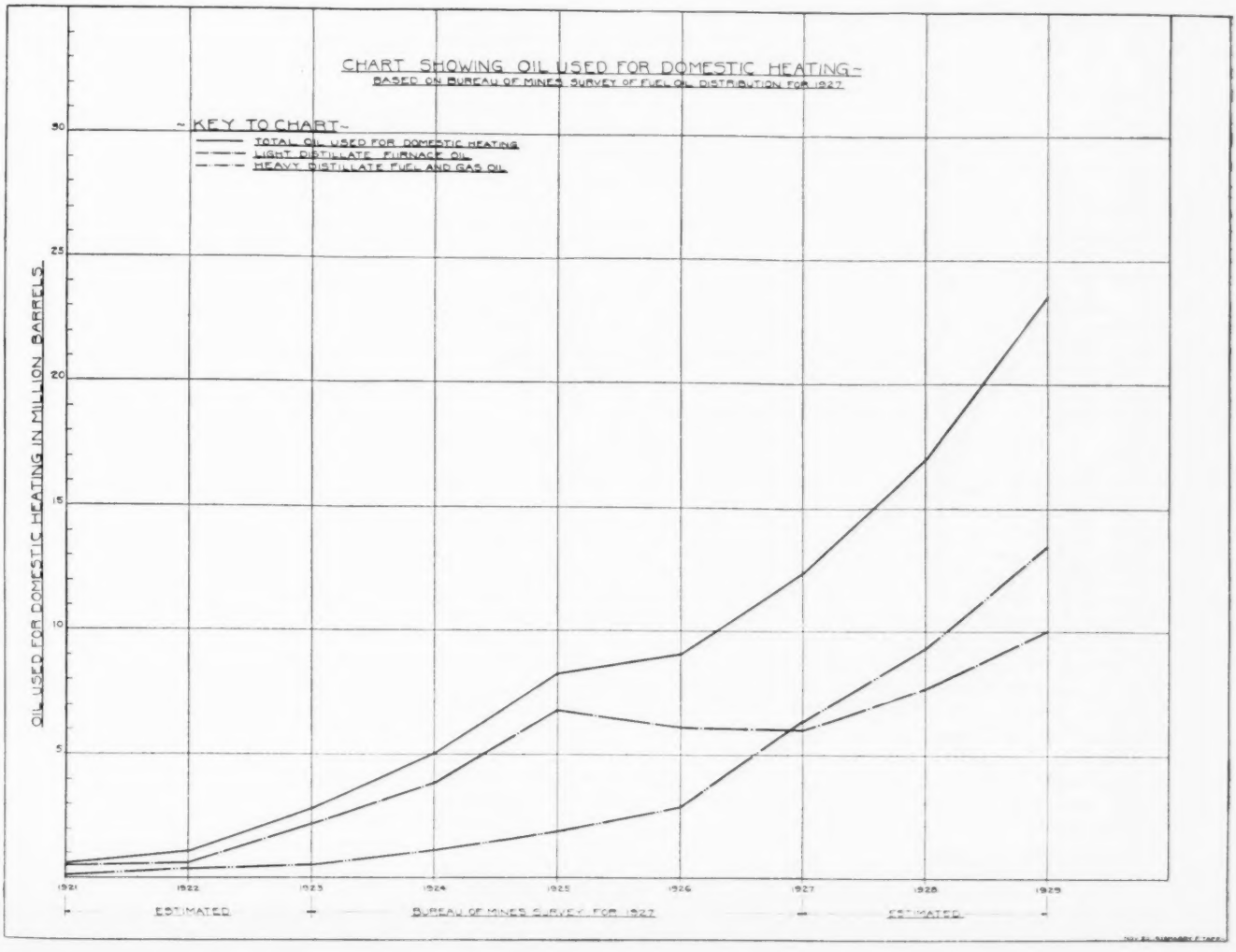
Table 1.—Oil Consumption by Domestic Burners

(Amounts in Barrels)

Year	Mechanical Draft	Natural Draft	Total	Light Furnace Oil	Heavy Furnace or Gas Oil
1921	300,000	300,000	600,000	500,000	100,000
1922	540,000	500,000	1,040,000	640,000	400,000
1923	1,410,000	1,410,000	2,820,000	2,260,000	560,000
1924	2,840,000	2,180,000	5,020,000	3,855,000	1,165,000
1925	4,700,000	4,130,000	8,830,000	6,860,000	1,970,000
1926	6,820,000	2,260,000	9,080,000	6,170,000	2,910,000
1927	10,600,000	1,780,000	12,380,000	6,000,000	6,380,000
1928	14,380,000	2,620,000	17,000,000	7,650,000	9,350,000
1929	19,890,000	3,648,000	23,538,000	10,038,000	13,500,000

Table 2.—Domestic Burners in Operation First of Each Year

Year	Mechanical Draft	Gain	Natural Draft	Gain or Loss	Total	Gain or Loss
1921	5,000	.....	7,500	.....	12,500	.....
1922	9,000	+ 4,000	12,500	+ 5,000	21,500	+ 9,000
1923	23,500	+14,500	35,300	+22,800	58,800	+ 37,300
1924	47,300	+23,800	54,500	+19,200	101,800	+ 43,000
1925	78,500	+31,200	103,000	+48,500	181,800	+ 79,700
1926	113,900	+35,400	56,500	—46,500	169,400	— 11,100
1927	177,000	+63,100	44,500	—12,000	221,500	+ 51,100
1928	239,000	+62,500	65,200	+21,700	304,200	+ 84,200
1929	331,500	+92,500	91,200	+26,000	422,700	+118,500



to use a smaller sized tank truck for his deliveries.

Demand for the heavy oils will vary according to the size of the burner installation and the building it is in. In a middle western city the demand from apartment houses varied from 9000 to 15,000 gallons per heating season. A button factory took 60,000 gallons a year, greenhouses 12,000 to 15,000 gallons and small factories 20,000 to 26,000 gallons. Most of these oils were all of a type heavier than those that are successful in domestic installations but this business might be cultivated by the oil man who can carry the slogan "Heat with Oil" into hundreds of places where oil is not now being used.

As the demand for burners increases, manufacturers will turn them out more rapidly. That will mean lower manufacturing costs and lower cost to the home owner. Lower prices of burners will mean a larger market for the oil man. It seems that the oil man should do a little missionary work in enlarging this opportunity.

Government Conservation Work To Go Forward

WASHINGTON, Dec. 4

THE government's work in conservation of the nation's oil supply is going forward, Calvin Coolidge reported at noon today in his last annual message to congress, as president of the United States.

"The practical application of economy to the resources of the country calls for conservation," said the President in opening his remarks on this subject.

He said estimates had been prepared and submitted to congress, in the budget, for carrying on the conservation work, not only as it pertains to oil, but other natural resources as well.

The only specific recommendation with regard to oil the President suggested to congress was a change in the law which requires the Secretary of the Interior to offer for lease Osage Indian lands regardless of the condition of the oil markets.

Practical application of economy to our resources does not mean that every resource should not be developed to its full degree, but it means that none of them should be wasted, said Mr. Coolidge.

"We have a conservation board working on our oil problem," he said. "This is of the utmost importance to the future well-being of our people in this age of oil-burning engines and the general application of gasoline to transportation. The Secretary of the Interior should not be compelled to lease oil lands of the Osage Indians when the market is depressed and the future supply is in jeopardy.

"While the area of lands remaining in public ownership is small, compared with the vast area in private ownership, the natural resources of those in public ownership are of immense present and future value. This is particularly true of minerals and the water power. The proper bureaus have been classifying these resources to the end that they may be conserved. Appropriate estimates are being submitted, in the budget, for the further prosecution of this important work."

Roy O. West, Secretary of the Interior, reporting on the work done by the department says the work upon which he is making a review is that done under the administration of his predecessor, Hubert Work.

Secretary West tells what the Federal Oil Conservation Board has done during the year. He includes the report to it of the Committee of Nine of the minerals section of the American Bar association and the effort to interest the governors of oil producing states in the work of the board in behalf of conservation legislation, state and federal.

"The cooperation urged upon the (oil) industry has become an active working force and practical conservation of this valuable resource is being attained through cooperation of federal and state officials with the executives of oil companies," he said.

"Conservation in its broadest sense, however, is not yet an accomplished fact. Much remains to be done, both by the federal and state governments if our natural petroleum resources are to be conserved."

In the part of the report devoted to the U. S. Geological Survey, the statement is made that 9,839,859 barrels of crude were produced on the naval reserves over which the Survey exercised supervision. The oil, gas, and gasoline royalty from that production was $2,232,375. The Indian lands in Oklahoma, over which the Survey also exercised supervision, produced royalty amounting to more than $7,000,000. In regard to oil and gas on Indian lands, the Indian Office said:

"Oil and gas mining leases were approved on approximately 208,000 acres of restricted Indian lands within 18 different reservations. A number of leases were made within reservations where there were no oil or gas producing wells and where heretofore there has been little or no oil leasing activity, particularly within the Cheyenne River Reservation, S. Dak., where 4960 acres were leased, and the Cheyenne and Arapaho Reservation, Okla., where 15,558 acres were leased; also 1520 acres were leased in Montana belonging to Chippewa Indian allottees under jurisdiction of the Turtle Mountain Agency.

There were 256 producing oil wells and 27 producing gas wells drilled during the year on restricted lands belonging to allottees of the Five Civilized Tribes in Oklahoma, which bring the total of producing oil and gas wells on lands of these Indians under supervision to 5,290 and 226, respectively. The total number of barrels of crude oil produced and sold from lands of the Five Civilized Tribes was 25,854,133, being nearly double the amount produced during the prior year. This increase in production was due in a measure to new discoveries in the Seminole country, although concerted effort to curtail production in that region was put forth by the operators. In the Osage Reservation where an attempt was also made to hold down production as far as possible, there were approximately 4,000,000 barrels less crude oil produced than during the prior year. The Osage Tribe received more than $11,500,000 from oil and gas leases during the year, while the Indians of the Five Civilized Tribes received in excess of $5,500,000 from their leases."

New Pay Horizon Found In Kansas Wildcat

By Telegraph

TULSA, Dec. 4.—A well estimated at better than 4000 barrels daily from an unexpected pay in the top of the Mississippi lime has been drilled in about six miles northeast of the Gypsy-Marland-Bu-Vi-Bar producers in Sedgwick County, Kans.

The well, the No. 1 Goodrich of the Marland Production Co., which is in the SW NE SW of 16-25S-1E had what is believed to be the top of the lime at 3010 feet, nearly 40 feet higher than the same formation was encountered in the first wells to the southwest. The well is in the center of a 3700-acre block owned entirely by the Marland.

Revise Uniform Balance Sheet

CHICAGO, Dec. 5.—Revision of the uniform balance sheet in line with experience which has been developed during the past year was undertaken at the annual meeting of the American Petroleum Institute by the committee on uniform methods of oil accounting.

T. S. Lungren, special aviation representative of Union Oil Co., recently returned to Los Angeles from a trip of several weeks in the East where he spent most of his time visiting the airplane factories.

Again We Define the "Group Three" Market

WE STILL find that many oil men do not appreciate the fact that the Group 3 Oklahoma price on gasoline is the price at which the refiners located in Oklahoma sell. These Oklahoma refiners make that price themselves by their sales and not refiners in Louisiana and Arkansas or Kentucky or Illinois, or any place else.

Refiners in these other districts sell oftentimes on a Group 3 price basis, but that does not mean that they have any effect upon the price of the refiners in Group 3. The only time it does have an effect is when they take away enough customers of the Group 3 refiners to make those refiners, when they so desire, change their prices to meet the competition of these outside refiners.

For the last year or two particularly, Group 3 refiners have not been trying to sell their gasoline all over the country. Time was when they were selling it as far east as New York state and Pennsylvania. As competition came up from the seaboard and other points, the Oklahoma refiners found that they had to meet low prices which gave a low net back at the refinery, or quit business.

After suffering for a long time from meeting those low prices, the Oklahoma refiners finally quit that far eastern territory. Today there are only a few Oklahoma refiners selling in Ohio and the chances are that they will not continue to do so next year.

By shrinking their marketing territory and holding down their runs, Oklahoma refiners have been able to get a good price for their gasoline this summer and fall. If these Oklahoma refiners had gone after business hard in Ohio and Pennsylvania, they would have had a much lower price by a cent or more at least.

What the Oklahoma refiners have done this past year has been a very sensible business-like thing and the only thing that they could do to save themselves from bankruptcy.

We have many times warned that portion of the industry which is outside of Group 3 natural marketing territory, against using the Group 3 price to contract on, because we have pointed out there could be times when the Group 3 price would be high for a given territory, which is more naturally served by other refining groups.

That is the case right now in Ohio, for illustration. There are many sources available for the purchase of gasoline for delivery in Ohio at under the Group 3 price. That is not the fault of the Oklahoma refiners nor the fault of any price reporting agency, as the Oklahoma refiners are entitled to make their own price and it is their privilege if they do not care to meet the low prices in Ohio of refiners from other parts of the country.

We may have shortly an arrangement which will accurately reflect the actual tank car market in the state of Ohio, regardless of the source of the goods and which arrangement may be of sufficient comprehensiveness to serve as a contracting basis; but the problem is difficult due to the fact that practically all refiners in the country have at times sold in Ohio, even California refiners whose material has been brought around to Atlantic ports.

But at all events, the trade should distinguish more exactly whether goods quoted on a "Group 3" basis, are coming from Oklahoma or somewhere else. It makes quite a difference.—W.C.P.

Burning Bellview Well Brought Under Control from the Top

Staff Special

LOS ANGELES, Nov. 30

THE Bellview Oil Syndicate's wild and burning well at Santa Fe Springs was controlled at the mouth of the well, without using the tunnel, shortly after noon Nov. 30, and two hours later it was estimated that the well was producing at the daily rate of 8000 barrels of oil and 6,000,000 cubic feet of gas.

The well was brought under control by placing a sleeve pipe down over the top of the drill pipe with the aid of a crane, and held partially in place until a clamp could be put in place in the cellar, which had been deepened. Mounted on the sleeve pipe was a cross permitting two 4-inch flow lines, one from each end.

Above this was a control for shutting off the flow of gas and oil into the air. A 40-foot stack had been placed above the connections to carry the flames far up into the air, making it easier for the men to work in the cellar and permitting the connections to remain cool.

The Bellview, near Four Corners in the business part of the Santa Fe Springs field, blew out Nov. 9 just after the drill pipe had been removed from the hole and while the crew was preparing to run in tubing for a test.

The blast was so severe that the steel derrick was wrecked and the debris fell on the control head so it could not be reached. The well immediately caught fire and has been fiercely burning ever since, with practically no letup or easing off. It had been estimated that the well was making between 10,000,000 and 20,000,000 cubic feet of gas and there was a question as to whether it was making any oil as there was no smoke.

Interested oil companies, with nearby properties, held a conference and appointed a committee composed of L. B. Little, Frank Hill and Harry Maddren to have charge of the plans to put out the fire. The committee selected C. W. Eckels, Union Oil Co. engineer, to have immediate charge of the work.

A tunnel was sunk and reached the casing of the well about 35 feet below the surface on Nov. 28, but the committee saw a chance to control the well from the top and the tunnel was not used.

The well was changed from a menace and a dead loss to a paying venture in 21 days. Officials of the Bellview Oil Syndicate indicated a perfect willingness to permit representatives of the various companies to dictate the manner in which the control work should be conducted, agreeing that all expenditures would be taken care by the Bellview.

The Bellview has been bearing the expense of 15 guards working under the supervision of the sheriff's office, and footing other bills. It was roughly estimated late this week that the work of control would cost close to $100,000, with a bare possibility that the cost will not exceed $75,000. Bellview officials stated that the control of the well would be taken over immediately by its own officials, as the danger passed.

Operations at about a dozen derricks had been at a standstill waiting for the fire to be controlled, and will be resumed at once. Several derricks were destroyed and these will be rebuilt. The output of the well is expected to pay all expenses within 30 days, if it does not decline too fast.

Review of Late Production News

ALTHOUGH production of crude over the country as a whole showed an increase of only 1150 barrels on daily average during the past week, there were large changes in two or three fields. Daily average production increased 1150 barrels the week ended Dec. 1, to 2,506,150 barrels, according to American Petroleum Institute.

Crude oil imports were 72,857 lower during the week, being at the rate of 228,857 barrels daily. Total new crude supply accordingly was 71,707 barrels lower, being 2,735,007 barrels daily average for the week ended Dec. 1.

California production showed the largest change for the week, output in that state gaining 11,000 barrels on daily average. Santa Fe Springs gained 4500 barrels and miscellaneous fields 4200 barrels.

Seminole area kept its downward trend, falling off 8050 barrels, to a daily average of 275,900 barrels. Most of this decrease was again in Little River which fell off 4800 barrels.

Winkler county in west Texas fell off 7950 barrels, Spindletop fell off 2000 barrels. Sulphur Dome in coastal Louisiana gained 2000 barrels.

Oklahoma-Kansas

EXCEPT for a few minor extensions to present pools, the Mid-Continent was quiet all week. Production of the Seminole district still declined although the St. Louis pool made a new peak Nov. 30 of 134,000 barrels. This was accomplished mainly by putting wells on the air lift.

Logan county, Okla., where the state's deepest pool is located, got another extension well. Sinclair Oil & Gas Co.'s No. 2 Weber made 2800 barrels from depth of more than 6000 feet. It pushed the field one location north.

The pool opened east of Little River several months ago, and shut in by agreement among operators, is now being outlined and thus far it is largely a failure. The discovery well is the only one to make any worth while volume of oil. Several failures and small producers have been drilled in the vicinity of the first well.

The second well in the new pool just north of Wichita, Kans., is holding up at 1800 barrels daily. It is one location from the discovery which came in last summer.

California

THE Bellview well was brought under control at Santa Fe Springs Nov. 30 and the flow was roughly estimated at 8000 barrels of oil and 6,000,000 cubic feet of gas. The well had been burning since Nov. 9. It was controlled through placing connections at the top of the hole, although the tunnel had been completed and would have been used if it had become necessary.

This well is producing from the intermediate zone, just above the Buckbee oil sand.

A late check indicated 227 wells actively drilling at Santa Fe Springs, but declines in production at a number of producers lead many to believe that the peak will be reached sooner than had been expected.

Associated Oil Co.'s Cypress 3, in the new Potero field near Los Angeles, blew out Nov. 29 and made about 1000 barrels of fluid, mostly mud with some oil, and 14,000,000 cubic feet of wet gas. Part of the control head was wrecked and three men were badly injured. The well was controlled and a liner will be run in, preparatory to making another test. The fact that the well is making wet gas is encouraging.

Long Beach is still a most active field, but the small number of completions probably means a decline in daily average production. Several new locations were announced.

Wyoming, Montana

THE Prairie Oil & Gas Co. has encountered a flow of considerable gas at 1300 feet in the base of the Madison sand at its wildcat well on Sheep Mountain structure in Big Horn county, Wyo. This well is east of the Byron field, and apparently proves another gas district in Wyoming.

The Gebo Consolidated Oil Co., newly-organized, has taken over all holdings on Gebo Dome, north of Thermopolis in Hot Springs county, and will drill a wildcat well there immediately. A well drilled by the Utah Oil Refining Co. there some years ago is now believed to have been one-half mile off structure.

Original promoters of the Frannie structure, on the Wyoming-Montana state line, will drill an offset to the discovery well immediately. Julius Peters and V. M. Kirk are the operators; both are of Great Falls, Mont.

The No. 1 Jones of the Fulton Petroleum Co. has proved that the theory of the extension of the Pondera field to the northwest was correct. The well was completed last week with an initial production of 500 barrels.

Texas, New Mexico, Louisiana

OPERATORS in the Winkler county area of the Permian salt basin have asked the Railroad Commission of Texas to raise the limit of their allowable production from 150,000 to 175,000 barrels daily under prorating practice. Proponents of the increase say excessive pinching of wells has carried back pressure beyond the point of retarding water encroachment and to the place where it brings greater encroachment.

The Leck area of northern Winkler county, nine miles in advance of the original Hendricks ranch development, was extended ¼-mile northeast when the Amerada Petroleum Corp. completed its No. 1 Daugherty, Sec. 3, block 74, at 3152 feet, for estimated initial production of 4000 barrels daily. Rational development is being practiced in the Leck area, but several test wells are drilling.

Wildcatting operations in southeastern Lea county, N. M., continued without developing any results that would change the current picture of production. Gassers drilled in the area have already outlined the trend of the sub-surface lime ridge extending northerly from Winkler county, Texas, and have indicated important future oil production.

In south Louisiana, The Texas Corp. has contracted with Louisiana Land & Exploration Co. to test nine and a fraction salt domes discovered by geophysical methods. Four tests are to be made on each of the nine solidly controlled domes of the Louisiana Land company and on any other such plugs as may be found in the future.

William C. McDuffie

Pacific Western Oil Co. Starts Business

LOS ANGELES, Nov. 30.—The recently formed Pacific Western Oil Co., of which William C. McDuffie is president and general manager with Jacques Vinmont as chairman of the board, has established offices on the eighth floor of the Petroleum Securities Building in Los Angeles and is in the midst of taking over oil properties purchased from the Petroleum Securities Co., a Doheny organization.

The personnel of the new company other than the directors, has not been announced. It is understood in Los Angeles that the cash payment of $25,000,000 was paid to legal representatives of E. L. Doheny, on Nov. 27 in New York, thus consummating the deal. This company starts out with a daily production of approximately 18,000 barrels, in addition to a number of drilling wells and considerable proven and semi-proven acreage.

This deal does not mean that E. L. Doheny will retire from the oil business. In partnership with his son, E. L. Doheny, Jr., he has already started to build up an oil business to be owned 100 per cent by the two. The two are now drilling three wells and have recently added considerable acreage to their holdings.

The board of directors of the Pacific Western as announced this week is as follows: William C. McDuffie, E. J. Nolan, George L. Eastman, David T. Babcock, Jacques Vinmont, Charles R. Blyth, Col. John Simpson, Earle Bailie and Lloyd S. Gilmour.

The new airplane bought by the Crystal Oil Refining Corp., Shreveport, and the Burford Oil Co., Pecos, Texas, has been delivered by the Spartan Aircraft Corp.

Texas Co. Has Control Of 9 Salt Domes

HOUSTON, Nov. 29.—Operating control of salt dome properties of the Louisiana Land & Exploration Co. has been acquired by The Texas Corp., under contract closed in New York.

The Texas Corp. has agreed to drill at least four test wells on each of nine new salt domes discovered by the Louisiana Land & Exploration Co. by geophysical methods. Similar testing is to be made of any future salt dome discoveries that may be made on the exploration company's 2,000,000 acres of Louisiana leaseholds and state land grants.

Mortgage bonds of the Louisiana Land company totaling $5,800,000, plus interest, have been assumed by The Texas Corp., but $800,000 of such obligations are to be paid back out of 50 per cent of the first royalties accruing from the properties.

On fee lands, The Texas Corp. agrees to pay 25 per cent royalty on oil and gas. Similar royalty will be paid on state lands, but Louisiana Land & Exploration Co. must pay out of its 25 per cent that royalty which goes to the state of Louisiana. Beyond other considerations The Texas Corp. agrees to pay the Louisiana Land company eight and one-third per cent of net profits after development costs.

Sulfur rights are included in the deal, The Texas Corp. agreeing to pay a royalty of 75 cents for each long ton produced. After all expenses have been paid the two companies will share equally in net profits from sulfur recovery.

Two producing wells on the East Hackberry salt dome are included in the deal. This dome is owned by several interests controlling separate leaseholds. On the nine geophysical domes mapped by the Louisiana Land interests their leaseholds or state grants cover entire structures.

Gallagher to Supervise Research

SAN FRANCISCO, Nov. 30.—Herbert R. Gallagher has resigned as vice-president in charge of sales for the Shell Co. of California to become president of the Shell Development Co. which is to control, coordinate and handle the Shell interests' research work in this country. A complete laboratory has been located at Emeryville, near San Francisco, which will be under the supervision of Mr. Gallagher.

Mr. Gallagher has been succeeded as vice-president in charge of sales, by E. L. Miller who has served for some time as Mr. Gallagher's assistant and his headquarters will continue to be in San Francisco.

H. B. Gutelius

Gutelius Vice President Of Continental Supply

TULSA, Dec. 1.—H. B. Gutelius, formerly manager of the Oklahoma-Kansas district for the Continental Supply Co., has been made vice-president of that company, and transferred to St. Louis, Mo. Charles J. Halloran, the assistant district manager, succeeds Mr. Gutelius as manager of this division.

Mr. Gutelius has had many years in the supply business. He was with the National Supply Companies for several years, leaving in 1916 to go with the firm of B. B. and M. Jones, noted producers. A year later he resigned his position there, and organized the Plymouth Petroleum Co. of which he became president, and which position he still holds.

In 1925 Mr. Gutelius joined the Continental Supply Co. as district manager of Oklahoma-Kansas, which position he has held until his recent promotion. He has made Tulsa his headquarters for the past 19 years.

Charles J. Halloran, who succeeds Mr. Gutelius as district manager, has been with the Continental Supply Co. for 11 years, starting as a billing clerk in St. Louis, Mo. in 1917. Later he was transferred to Fort Worth.

For the next six years Mr. Halloran served his company in varied capacities in many Texas oil fields. Three years ago he came to Tulsa as district sales manager, and after 8 months, was made assistant district manager, which position he held until his recent promotion by which he succeeded Mr. Gutelius.

The Spartan Aircraft Corp. recently sold a new ship to R. A. Westbrook, prominent oil man who lives at Fort Worth. The sale was made by the Texas representative of the company, William "Bill" Ponder.

Joint Committee Is Working On Anti-Knock Standard

CLEVELAND, Dec. 1

A JOINT committee composed of automotive engineers, oil technologists and representatives of the Bureau of Standards, is now working to devise a uniform method of determining anti-knock value of motor fuels and of stating that value when determined.

A letter to NATIONAL PETROLEUM NEWS from Neil MacCoull, automotive engineer and oil technologist for The Texas Co., informed NATIONAL PETROLEUM NEWS of the work of this committee. His attention was drawn to this subject by an editorial in its Nov. 21 issue setting forth the need of such a standard. The letter to Paul Truesdell, staff writer, was as follows:

"Since this editorial (previously referred to) asks for standardization work which is almost exactly what is now being done, I wish to call your attention to our work. The cooperative fuel research steering committee, which is made up of representatives of the Society of Automotive Engineers, the American Petroleum Institute, the National Automobile Chamber of Commerce and the Bureau of Standards, appointed a sub-committee some time ago to develop an engine and method which could be used for standard anti-knock measurements.

"This committee is made up of: T. A. Boyd, General Motors Research Corp., chairman; Graham Edgar, chemical director, Ethyl Gasoline Corp., J. B. Hill, chief chemist, Atlantic Refining Co.; D. P. Barnard, technologist, Standard Oil Co. of Indiana; Harry F. Horning, president, Waukesha Motor Co.; H. C. Dickinson, Bureau of Standards; H. K. Cummings, Bureau of Standards; Neil MacCoull, The Texas Co.

"Work has progressed to the point we have approved designs of a test engine which is apparently satisfactory to all members. A lot of these engines are now being built and as soon as possible each member of the committee will have one in his laboratory for experimental work.

"We hope that after a reasonable length of time any changes that are necessary can be made in the engine itself and that members of the committee can agree on the same definite test routine.

"You realize, of course, that this is going to take considerable time but I am very hopeful the work of this committee will result in standards which will meet the great need of the industry at present."

White Oak Refining Plant To Be Enlarged

TULSA, Dec. 3.—The White Oak Refining Co. will increase the capacity of its plant at Allen, Okla., from 2000 barrels to 8000 barrels per day, it was announced today by Victor H. Smith, president. The plant is expected to be ready for operation on a larger scale by Feb. 1.

The plant addition will consist of seven shell stills in a continuous battery equipped with Winkler & Koch bubble towers. Twenty new refinery storage tanks, with a combined capacity of 156,000 barrels, are being erected in connection with the skimming plant.

The company also has closed a contract with the Graver Corp. for the erection of a 1200-barrel Jenkins cracking unit to be equipped with a Gray tower and treating plant. The cracking unit is expected to be ready for operation before spring.

To provide additional crude supplies for the plant a new six-inch line is to be laid from Allen to Sec. 7-9-6 a distance of 27 miles where four 55,000-barrel tanks of Earlsboro crude have been purchased from the J. A. Hull Co. In addition an eight-mile extension will be laid from the terminus of the present line in Sec. 21-8-6 to Sec. 20-8-5 in the new Maud area.

The White Oak recently declared a 100 per cent stock dividend and increased its authorized capital from $100,000 to $325,000. The company is owned largely by the Gulf States Terminal and Transport Co.

C. E. Robertson, formerly superintendent of the Humble Oil & Refining Co. plant at San Antonio and later assistant superintendent at Baytown, has been made general manager of refinery operations for the company. B. E. Conner, formerly general auditor of the Producers & Refiners Corp., has been made secretary of the company and elected to the directorate.

Other members of the board of directors are Mr. Smith, L. W. Pratt and Frank Sowle of Tulsa, and Edgar Molitor, vice president of the Hibernia Bank and Trust Co. of New Orleans. The board of the Gulf States Terminal and Transport Co. is the same except that Walter Johnson is a vice president and director while Mr. Connor is secretary but not a director.

The Gulf States has terminal facilities for liquid products at Aransas Pass, Galveston, Houston, Texas City and New Orleans and has arranged for the use of facilities at Savannah, Pensacola and Mobile. The company moved 2,500,000 barrels of petroleum and its products to export this year in addition to its coastwise and bunkering business.

Skimming Plant at Del Rio To Use Yates Crude

HOUSTON, Nov. 29.—Confirmation comes from San Angelo of reports that the Del Rio Refining Co. will build a skimming plant of 2000 barrels crude capacity at Del Rio, Val Verde county, on the Southern Pacific railroad.

The company is composed of T. R. Cowell, Jr., R. P. Humes and W. C. Adams, all of San Angelo. Crude will be supplied under contract by the Illinois Pipeline Co., companion corporation to Mid-Kansas Oil & Gas Co., principal operator for joint account of itself and the Transcontinental Oil Co. in the Yates field of Pecos county.

The Del Rio company proposes to sell its gasoline in the general market and to move its fuel oil to the Southern Pacific railroad.

A 38-acre site for the refinery was donated the company by the city of Del Rio.

Will Enlarge Cyril Plant

TULSA, Dec. 3.—The Anderson Prichard Oil Corp. will increase the capacity of its refinery at Cyril from 2500 barrels to 5000 barrels per day within the next few months, according to L. H. Prichard, president. Increasing demand for the special naphthas and technical oils manufactured at the plant necessitate the expansion.

In addition to the enlargement of its skimming facilities, the company plans to erect a cracking plant to process heavy oils. No decision has been made as to what type of process will be built.

To provide additional crude supplies the company will lay 40 miles of four-inch line from Cyril to the Duncan fields. The new line will be ready about Jan. 1. The Col-Tex Refining Co., a sister company, is laying 30 miles of four-inch line from its Colorado, Texas, refinery to Howard and Glasscock county fields.

Dean New Plant Manager

TULSA, Dec. 3.—D. A. Dean, formerly of the Oil State Refining Co., has been made manager of refineries for the Homaokla Oil Co., according to John E. Dickson, vice president and general manager. R. L. Johnson will be superintendent of the Allen plant purchased from the Oil State. The capacity of the refinery will be increased from 1000 to 2000 barrels per day.

Tulsa, Okla.

WEWOKA, county seat of Seminole county, is in the throes of a grand jury investigation into vice conditions in the Seminole district. The affair was stirred up several weeks ago by the Daily Oklahoman, of Oklahoma City, which assigned a reporter to write of conditions. Assertions that county authorities have been lax in law enforcement are being aired by the special grand jury.

Conditions have been bad, it is true. They have been no worse than in other notable oil fields, such as Borger and Smackover. Every major oil boom gets its share and if the present attempt to find oil just south of Oklahoma City is a success in a large way, the Daily Oklahoman will be given the opportunity to air conditions at home. Bootlegging, gambling, prostitution and dope peddling invariably establish themselves wherever an industrial boom occurs. In the Seminole district, the town of Seminole got the first crop. That town has grown quieter as the drilling campaign moved on and will soon be in the class with Drumright, El Dorado, Ark., Mexia and other towns where the transient worker was succeeded by the production man who brings his family and establishes his home.

The chief dispute we have with the Daily Oklahoman on its major premises is its insistence that dope peddling has reached alarming proportions. Doubtless there is plenty of it to be had, but it is not debasing the oil field worker to any alarming extent. Dope is used by the specialists in vice, not by the driller and the roughneck. The latter two patronize the bootlegger, as do the people all over the country, but dope and the oil field work do not agree.

A clean-up of conditions in Seminole county, however, is in order, for the man who works all day is not safe at night from the hi-jacker. The oil companies themselves should get behind the crusade. The writer has it from the workers themselves that it is unsafe to be out along the road after night. One told of being in a crew of 16 men riding on a truck. They stopped to change a tire and two hi-jackers held up the whole party, taking all the money they had. It seems absurd that 16 men would not find some way to defend themselves, but nobody wants to irritate the average hi-jacker. He frequently is a dope addict and is easy on the trigger.

A state constabulary seems to be needed in states which have periodic oil booms. Twenty-five good men, of the type of the famous Texas Ranger or Canadian Mounted, would make short work of driving out those who could give no good reason for hanging around the oil fields.

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L. B. (Tip) O'Neill has resigned as vice-president in charge of operations in the Northwest for The Texas Production Co. He was one of the successful operators in the Sunburst field of northern Montana and with his brother John built the International refinery at Sunburst. The O'Neill properties were sold to the California Petroleum Corp. which in turn was acquired by The Texas Corp. The O'Neill brothers named, with a third one, Ignatius, plan to resume operations as independent producers.

This is not O. E. Dougherty's natural expression, but one he employs when watching the flight of a golf ball or the depth a truck has sunk in the mud. Emmet, as he is known that being his name—is division superintendent of the Sinclair Oil & Gas Co., with the Seminole field and such like chores to attend to

Fred C. Shields, of the Sinclair Oil & Gas Co. geological department, Tulsa, and Miss Helen James, of Okmulgee, were married Nov. 26.

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Fritz Aurin, former chief geologist of the Marland Oil Co., is occupying a similar position with the Southland Royalty Co., which is headed by E. W. Marland and directed by a number of the former executive officers of the Marland company.

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District headquarters of the Skelly Oil Co. have been moved from Slick, Okla., to Bristow. A site has been purchased on which residence houses are being built.

* * *

Arthur G. Dana, vice-president and general manager of the Prairie Oil & Gas Co. of Wyoming, has enrolled for a brief term in the Electoral College, the people of Wyoming having voted him a free scholarship. One of the traditions of this college is that it ballots on the candidates for president. While Mr. Dana has not made a statement, it is said by those close to him that he will vote for Herbert Hoover.

* * *

Oil company accountants have organized, under Oklahoma charter, the Petroleum Accountants Society. The aim: To develop, improve, extend and standardize petroleum accounting. D. B. Catterlin, of the Gypsy Oil Co., is temporary secretary. The first regular meeting will be held Dec. 13, in Tulsa.

* * *

The extreme northeast luncheon table in the Tulsa Club has completed its work of picking an All-American football team and will begin, as soon as the A. P. I. meeting is over, the selection of Mr. Hoover's cabinet for him. Some of the best minds of Tulsa will be at work on this problem, including George Canterbury, Otis McClintock, Henry McGrew, Hunter Martin, Murray M. Doan and Rush Greenslade.

* * *

Frank Buttram, president of the Buttram Petroleum Co., who recently returned to his Oklahoma City office from Europe, booked passage for another trip to start Dec. 1. Mr. Buttram has four children in school in Switzerland, at Lausanne, and will be

gone three or four months this time. Mr. Buttram, who attained marked distinction as a petroleum geologist before he became an operator, was highly successful in the Mexia-Powell district of Texas. Of late he has devoted more time to California than to the Mid-Continent, although his principal offices and home are in Oklahoma City.

* * *

We might say—in fact, we almost said it—that Jack Vickers has as his hobby the oil business. Memories of the days when six horses kept your correspondent busy cause amazement that a man can get along with 58 of them, as Mr. Vickers does. Of course he doesn't curry and bed them down personally. His farm is near Wichita and he does get around to see how things are going between trips over Kansas to look at the way the Vickers Petroleum Co. is going.

Mr. Vickers' colors will be seen in the winter race meet at Tia Juana. In the spring he will play polo in Mexico City. Tommy Hitchcock, famous polo player, used two of the Vickers mounts in the international polo tournament last fall, hence the Vickers name is getting pretty well noised about the country. Recently, Mr. Vickers' star hunter destroyed himself in trying to jump out of a box stall. This was the heavyweight horse he had planned to show at the National, held in New York in November.

* * *

Several changes in the sales department of the Sinclair Refining Co. have been announced for western territory. P. N. Asbury, who has been in Dallas, has been transferred to Tulsa as city salesman; J. W. Whitehead, former manager of lubricating oil sales in the western district, is now general agent in Kansas City, succeeding E. B. Dalenpine, who has been transferred to Denver as manager of the district embraced in Colorado, New Mexico, Arizona and western Nebraska; C. C. Martin, who was in charge at Denver, has been transferred to New York and J. R. Bolt, former assistant to Mr. Whitehead, is manager of lubricating oil sales of the western district.

* * *

Quite a few of our stock market adventurers in Tulsa are suffering from Scotch losses. Such a loss is incurred when you sell at a profit but could have made more by hanging on.

* * *

Charles Allen Philbrick is a new junior associate member of the American Association of Petroleum Geologists. He arrived at the home of Mr. and Mrs. E. P. Philbrick recently. Mr. Philbrick is geologist for the White Eagle Oil & Refining Co., Tulsa offices.

* * *

C. M. Rader, of the Indian Territory Illuminating Oil Co., has been made manager of the personnel and planning division, a new department in the company. He has been associated with the I. T. I. O. for some time. He began as engineer in the Seminole field, later becoming assistant to A. V. Hoenig, vice-president, and a short time ago was transferred from the field to Bartlesville. Mr. Rader was one time engineer for the Midwest Refining Co. in the Salt Creek field.

* * *

How much attention conservation legislation will get in the coming session of the Oklahoma legislature is a question. The lawmakers show signs of being quite busy throwing out the governor and investigating most of the departments of the state government. The highway department will come in for its share of trouble. The state needs a real program of highway building. It goes along hard-surfacing three miles here and there and spending too much money maintaining dirt roads. An entirely logical conspiracy to put the whole thing under one man and let Lew H. Wentz, multi-millionaire oil operator of Ponca City be that man, came into the open a few days ago. Whether Mr. Wentz would consent to tackle the job has not been revealed.

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E. J. Stephany, of Pittsburgh, well known to natural gas men, has been appointed secretary of the natural gas department of the American Gas Association. He has been assistant manager of sales and service for the Philadelphia Co., with which company and its subsidiary, Equitable Gas Co., he has been associated for 10 years. The first meeting of the department he will attend is that to be held Jan. 14 and 15 of the southwestern division. It will be held in Shreveport. Henry C. Morris, of the Dallas Gas Co., Elmer Schmidt, of the Lone Star Gas Co. and N. C. McGowen, of the Palmer Corp., are arranging the program.

* * *

There is need now for a standard reference work on committees in the oil industry. There are so many committees of nine, seven, eleven, three and five, known by no other names, that even those who attempt to keep up with them are constantly getting mixed up and attributing some noble piece of work to the committee of five when, as a matter of fact, the committee of seven should have the medal. The man who gets up a good index system on committees might also turn his attention to simplification of titles of certain organizations and committees. There is, for instance, the American Petroleum institute division of development and production engineering. Imagine, trying to get that in a headline! And if you add the name of the branch chapter of this formidable sounding division, it is more than human flesh and blood can bear. But the worst one was committed at Wichita last week when there came into being (get the predicate first, or it will be lost to view) the subcommittee of the Committee of Nine of the mineral section of the American Bar association.

* * *

Forest R. Rees, Tulsa geologist, missed a shipwreck only because he was unable to get passage on the ill-fated Vestris. He tried to leave for South America on that ship. Mr. Rees, one time chief geologist of the Skelly Oil Co., now does consulting work for New York capitalists.

* * *

Frank Frantz, familiar figure in the Rocky Mountain oil territory and discoverer of the Cat Creek, Mont., field, is to make his home and principal place of business in Tulsa. He has been living in St. Louis for the past two years, prior to which he was for several years in Denver. Mr. Frantz, one of the Rough Riders of the Spanish-American war, and great friend of President Roosevelt, was the last territorial governor of Oklahoma.

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Patrick J. Hurley, former head of the Gilliland Oil Co., former banker, is devoting his time to building apartment hotels. One is under construction in Tulsa and others are announced for Wichita and Oklahoma City.

* * *

Oklahoma's twenty-first birthday was observed with proper ceremony in several cities. More than 500 attended the dinner in Tulsa the night of Nov. 16, when pioneer citizens told of the early days in Indian territory and over on the "old Oklahoma" side of the state. All of the six men who have governed the state since its admission into the union in 1907 are living and most of them participated in the anniversary celebration.

The celebration, of course, unleashed a flood of reminiscence all over Tulsa. Numerous were these who could remember the time when they could have bought everything in sight for small money when they first came here. The writer can remember vaguely that about 1897 Tulsa didn't amount to much and that Claremore, now just a fair sized town, was the metropolis of this part of the country. Tulsa got started when the oil boom hit the Indian country. Some Tulsans had the enterprise to build a decent hotel and the oil men started coming. They are still coming. Towns that are hopeful of amounting to something should first provide a good place for visitors to stay.

* * *

Oklahoma City's oil fever is being turned to account in a new way. A building and loan company is using the possibility to scare people who do not own their homes. "I feel certain that oil will be found," says the manager in an advertisement, proceeding then to say that the vast horde of people that will move to Oklahoma City will make it tough on those who now live there and pay

rent. Few wildcats in recent years have so stirred a community as the one the Indian Territory Illuminating Oil Co. is drilling just south of the capital city.

* * *

From the weekly question and answer column in a Tulsa newspaper, answers by Dr. Charles N. Gould, state geologist of Oklahoma:

Q.—Please tell me where to buy an instrument that will find oil.

A.—The only instrument that I know of that will find oil is the drill. You can buy one at pratically any supply house that deals in drilling machinery.

* * *

Would it be possible for the oil industry, in the interests of business building, to claim exclusive rights on some noble human motive? The florists have arrogated unto themselves loyalty to mother and the furniture dealers adjure the public to buy lots of furniture to prove their love of the home. A colleague suggests that the oil industry put on "Visit Your Relatives Week" as something that would make for heavy purchases of gasoline and oil.

* * *

Oil operators of Oklahoma are glad to see that the work of completing the topographic map of the state has been resumed. Five members of the "tope" branch of the U. S. Geological Survey have been assigned to start immediately on a federal-state arrangement. Very little has been done in western Oklahoma and with the vast leasing that has been done in the past year and the possibility of development, topographic maps will be vital.

* * *

The tallest flagpole—113 feet—has been raised in Tulsa at the building of a new auto laundry. Now for a flagpole sitter to dedicate it.

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Paintings by Gilbert White, noted artist, were unveiled in the state capitol at Oklahoma City, Nov. 11. They are the gift of Frank Phillips, president of the Phillips Petroleum Co., Bartlesville.

* * *

E. B. Howard, oil man and several times congressman from the First district of Oklahoma, was defeated in the Republican victory which carried the entire state. Mr. Howard has been a good public servant and his failure to win is regretted by the many who have had dealings with him. Charles O'Connor, Tulsa attorney, won.

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C. V. Sidwell is a new member of the petroleum engineering staff of the Amerada Petroleum Corp. He came to Tulsa from Eastland, Tex., where he spent more than a year with the L. H. Wentz oil interests. Prior to that he was for four years with the Pan-American company in Mexico.

The Mission field, in the Seminole district, Oklahoma's present hot spot of activity, gets its name from the Seminole school which stands on a hill overlooking the entire field. The school, is visible for many miles, being a huge red brick structure, of the architectural style followed by colleges years ago. Its official name is Mekusukey Academy, from a branch of the Seminole tribe. It is between 45 and 50 years old and was established by the Presbyterian Board of Home Missions. In 1910 it was taken over by the federal government and has since been operated under the department of the interior.

The school is several miles from any town, except the new "rag town" called Mission City, which has sprung up since field development got under way a month ago. About 100 little Seminoles attend school, many of them against their will. The names Fixico, Harjo and Tiger predominate. Harjo, it is said, means tiger and many tribal members have adopted the English equivalent of their name. Sixteen employes conduct the school, three of them being teachers. The school owns a fair amount of land, most of it in the money on this oil play, and considerable revenue will come to it. Another school probably will be built and this one abandoned, as it is not modern and is in need of general remodeling, if the oil royalties amount to enough to do it.

* * *

Mr. and Mrs. Edwin I. Reeser have returned from their European honeymoon and will live in Tulsa. Mrs. Reeser formerly was Mrs. Marie Parker Pearce. Mr. Reeser is a son of the president of the Barnsdall Corp. and is prominent in the oil royalty business.

* * *

Death of John L. Fitzpatrick, superintendent for The Texas Co. in the Big Muddy field, Wyo., occurred late in October. He had recently been transferred by the company from Tow Creek field of northwestern Colorado. His widow and two children survive.

W. D. Emery, district manager for Foxboro Co., Inc., Tulsa headquarters, has resigned and has been succeeded by J. B. McMahon. The latter has been in charge of the Dallas office of the company. Mr. Emery is now associated with B. V. Emery in the National Bank of Commerce building, Tulsa. Mr. Emery is distributor for refinery supplies and production specialties.

* * *

E. C. Wilber, formerly production superintendent for the Marland Production Co. in the Tonkawa field, has been made division superintendent succeeding L. J. Mildren. The Security Copper Co., an enterprise financed by Ponca City men, is about ready to start production on its Arizona holdings. Mr. Mildren left the oil business to give full time to the copper company, of which he is a director.

* * *

Mrs. P. R. Smith, wife of the Pure Oil Co.'s manager of the Arkansas producing division, died late in October in a Fort Worth hospital. Mr. Smith had recently been transferred to El Dorado, Ark., and his wife had remained in Fort Worth, where she was believed to be recovering nicely from an operation. Burial was in Phillipsburg, N. J.

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Tom Rozelle, who resigned recently as manager of the Pure Oil Co.'s Arkansas producing division, is now with the Lion Oil & Refining Co. at El Dorado, Ark.

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L. D. Wyant, who returned from the Argentine some months ago, is now with the Tidal Oil Co., Tulsa. Mr. Wyant spent more than three years in the Argentine, building and operating a refinery and gasoline plant for English interests.

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Dr. W. P. Haseman, formerly head of the research department of the Marland Oil Co. is now in Oklahoma City in consulting work.

The Editors' Viewpoint

National Petroleum News

State Conservation Laws The Next Order of Business

YEARS of discussion on the advisability of securing state laws to effect conservation of gas and more orderly development of oil pools is soon to reach fruition in the form of proposed bills introduced in state legislatures. Presently it will be seen whether there is a vigorous demand in the industry for such legislation or whether the battle has been pitched by a comparative few.

It is now the duty of every oil producer, large or small, to inform himself as to what is being proposed. This is not said in the sense of a warning that something inimical is about to be "slipped over" on the industry. The statement is prompted by contemplation of a few laws, praiseworthy in motive, that were enacted without well informed public opinion back of them. Quite naturally they fell into oblivion from which no amount of prodigious effort could revive them. Furthermore, they stand in the way of more enlightened attempt to legislate along the same lines.

The oil industry should, therefore, know its mind on the subject of legislation. It should examine carefully the provisions of the proposed bill which is now in course of preparation. It should decide just how the law will alter the course of development and whether it can see in it the benefits, in the form of more stable conditions, better balancing of supply of oil to demand, which the industry long has earnestly desired.

Then, if the industry decides that the bill as drawn meets the needs, it should get behind it in every state that produces oil, and give it the most vigorous support. Opportunity for discussion will be afforded, for the committee that is drawing the bill will submit it to every one of the oil and gas associations.

What is proposed is a law that will afford to the industry the widest latitude in originating conservation plans. It is to be flexible enough to cover the varying conditions in pools that will be discovered. It will take into no account the fields now producing, effecting no changes in their operation.

The ends sought probably will be covered by two statutes. One will affirm the common rights of all producers in a single pool in the gas energy thereof, prohibiting waste or disproportionate taking of the gas by one or more operators as against the others. The other phase of the subject will probably be covered by a law which will set up the form of action for operators to take in new pools to effect orderly development.

When a pool is discovered, the owners of acreage in the vicinity would meet on call of one of their number to formulate the rules under which the pool would be operated. If a majority agreed upon the basic policy to be followed, the conservation agency of the state government would then hold a public hearing, after which the rules would be promulgated as the law to follow in that particular pool. Similarly, a majority of the operators could decide to change the rules.

Something similar to this has been done in the Seminole district for the past two years, whenever a new producing spot was opened. Rate of drilling was the factor usually considered in such meetings. No attempt was made to regulate pressure withdrawal, as is contemplated in the proposed legislation.—L. E. S.

Making the Most of the Exposition

THE International Petroleum Exposition held at Tulsa in October was a much better, bigger and smoother run exposition than any of the seven held so far. It made a better educational contribution to the oil industry in oil field, oil refinery and oil marketing equipment, than ever. And the industry availed itself of the opportunity in larger numbers. Also the exposition was a financial success, paying its own way, paying for many improvements at the grounds and lacking possibly only $1000 of cleaning up the last of the indebtedness of previous shows.

For all this success and value the industry is indebted to W. G. Skelly, president of the Exposition, J. Burr Gibbons its general manager and the officers and men who did the work to put it over.

Now the directors are deciding as to the next show. General Manager Gibbons recommends that more organizations interested in the oil industry hold their meetings at Tulsa during the Exposition.

Obviously more is needed to make the Exposition a growing future success than just a collection of equipment, valuable as that may be. The presence of a number of oil and technical associations in session, talking about development of different phases of the industry, about the development of and the use of better equipment, would not only bring the Exposition to a higher level in the eyes of the industry but would also sharpen the interest of those attending in what the exhibitors have to offer.

And the exhibitor pays the freight. It is estimated that it cost them at this last show more than a million dollars to exhibit. The cost of space is the least of their expense; much greater is the cost of bringing and installing the equipment shown and providing the men to show and demonstrate it.

The cost to the exhibitors is so great that they can properly ask the oil companies to make a careful survey of their organizations and the men they sent to attend the Exposition to see just how much good each man got out of it. Such a survey can be easily made by questionnaire to 100 or so of the leading oil companies and it can be answered by the executives after they have had every man in each organization make a written report on what he got from the Exposition; and after every department head had checked with those men and put a value on what they obtained. From these men could be had information in what types of exhibits they were most interested, on what they got from the fine technical exhibit etc.

It is possible that such a survey will show that the oil companies have not taken full advantage of the Exposition; that they could send more men and give them

better instructions on how to get the most benefit. The exhibitors are justified in asking that the oil companies take the fullest advantage possible of the show.

The technical men of the industry, who are primarily educators at heart, could be asked to study this survey and the show and see in what way it could be improved and greater use made of it, because the Exposition is far more an educational proposition than it is commercial. The show could possibly be turned into a kind of an oil college with prominent educators on technical subjects conducting classes.

Everything that possibly can be done should be done to key the Exposition in men's minds to progress and development in the industry and to greater achievement in the search for better ways and lower costs.

This is not said by way of criticism of past shows. What critical thought may be in the foregoing is there only to emphasize as strongly as possible the tremendous opportunity for oil industry education that lies in these excellent expositions and to urge, in view of the size of the opportunity and the great cost thereof, that the utmost be done to get all out of the expositions that is possible.

The officers and directors of the Exposition are studying this big future but perhaps others in the industry may be able to lend a hand to develop this study.—W. C. P.

Casing Threads Important

ONE of the most important phases of the entire movement for the standardization of oil field equipment hinges on interchangeability. To get the value of interchangeability it is necessary to follow American Petroleum Institute standards, as specified, with particular regard for such things as threads and so forth.

Operators using A. P. I. monogram casing have found themselves forced to use 10-thread material, notwithstanding that some of them had previously bought 8-thread pipe and thought they preferred it. Improvements made in threads have done away with objections previously found by some operators in using fine-thread pipe. Again, operators who opposed the change from 8-thread material are finding that 10-thread casing will make a better joint if more pains are taken in its use.

It is true that in oil field practice it is easier to stab 8-thread than 10-thread material, but if a better joint is obtained by using a little more care in the work the advantage is obvious.

Originally there was some objection to the finer 10-thread material because of cross-threading, but this did not apply to the smaller sizes of casing. The objections, however, were before the adoption of the new bevel angle now specified in A. P. I. standards.

Louisiana operators were among the first to use 10-thread material throughout the various deep fields, conforming in this regard 100 per cent to A. P. I. standards. They were brought to such practice, however, by rulings of the conservation commission, which prescribe without exception that all casing used in deep, high pressure areas shall be of the size mentioned and tested at the well by means of hydraulic pressure pumps. The department also prescribes complete jacketing in cement of all casing strings exposed to formations.

It is the contention of the Louisiana commission that 8-thread material weakens the casing string as compared with 10-thread. This is borne out in a measure in remarks of Carl A. Young, standardization director of the A. P. I., before the Texas-Lousiana-Arkansas district of the Division of Development and Production Engineering recently at Galveston.

Mr. Young said that 10-thread casing is so much stronger than 8-thread that the objection had been naturally raised that it takes more clearance to make up than the 8-thread. That, he said, is the only objection made to 10-thread material that cannot be remedied. If, however, the advantages of tighter joints are generally recognized need that be considered a disadvantage.—P. W.

We Should Build to Discourage Fire

TO SAVE a few dollars, some oil marketing companies continue to build into their bulk stations unnecessary fire hazards. They continue, it seems, to crowd a lot of gasoline and oil tanks on a small lot and then jam frame sheds or buildings and perhaps a wood fence, right up against the tanks.

Such construction is the height of folly for if a fire starts, there is little chance of saving the tanks.

Worst of all, because of the closeness of the wood construction, the chances are the tanks will be turned into stills and unless they have very large vents and loose fitting manhole covers, will blow up. This explosion will not be from fire within the tank but from vaporizing the contents faster than the vents will give relief—like building up too much steam pressure in a boiler.

We observed from the train window in going through a small western town the other morning, a group of six or eight 20,000 gallon tanks, with not two feet between each tank and all huddled up against a frame building which actually touched the steel of several of the tanks. A fine place for a big fire which no fire department or special oil fighting equipment could hope to cope with.

Fires may not come often nor to every one, but they should be guarded against, not only with a fire insurance policy but better still, with sane and intelligent layout and construction of plant—W. C. P.

Serving the Field Man

LOCAL chapters of the American Petroleum Institute Division of Development and Production Engineering promise to bring directly to the field superintendent and his foremen a means of discussing problems developing from day to day. As now proposed they would be held about once a month in each general area of development.

Free discussions of local problems would be made and the data developed would form the background for field papers to be presented to such district meetings as the Galveston gathering of the larger Texas-Louisiana-Arkansas branch of the Division of Development and Production Engineering.

The Galveston meeting unanimously indorsed the proposal to form local chapters in the fields embraced in Texas-Louisiana-Arkansas territory. Now the proposal goes to the general committee of the Development and Production Engineering Division for more specific action.

There can be no doubt of the advantages to be obtained from the working out of such a plan, both in dealing with specific field problems and also in furthering the cause of equipment standardization.—P. W.

Santa Fe Springs Conservation Plan "Biggest Step in Cooperation"

By M. E. Lombardi*

Presented Before American Petroleum Institute, Chicago, Dec. 4-6

CHICAGO, Dec. 4

COMPLETE details of the plan for operating the Santa Fe Springs, Calif., oil field under unit control were first made public in a paper M. E. Lombardi, Standard Oil Co. of California, was to present before a group meeting of the American Petroleum Institute Dec. 5.

Mr. Lombardi was made chairman of the Operators General Committee on Gas Conservation when it was formed in California nearly a year ago to direct the carrying out of a general gas conservation program.

Despite the fact there are a large number of small operators in this pool, where new production has been found in the last few months from a deeper sand, and a host of royalty owners, the principal oil companies are leading in an effort to have the entire pool put under one management, which would be in effect an engineering control board.

Unit operation, as now proposed there would be along two lines. First it would provide for restriction of both gas and oil production from the new zone, by repressuring, by a fixed percentage of net production for each well. Second, by storing surplus gas from the new oil producing zone in an upper depleted Meyer zone. Operators owning production in this Meyer zone now are to be formed into a non-profit organization to take over this repressuring work.

The plan now being worked out is described by Mr. Lombardi as the "greatest forward step in cooperative operation so far planned." The early part of his paper is taken up with a general statement of what has been accomplished in California the past year under the gas conservation program, initiated by the governor about a year ago.

WE MAY now look at plans for the future and the expected surplus of gas from the deeper sands at Santa Fe Springs.

* * *

To meet this problem meetings of all Santa Fe Springs operators were held Sept. 20 and Oct. 4. The usual committees were appointed and their reports and recommendations have been accepted by the operators.

The committees found that a peak output of 319,000 barrels per day of oil and 387,000,000 cubic feet per day of gas was to be expected in January, 1929, declining to 111,000 barrels and 121,000,000 cubic feet in July, 1929. Almost all this gas would be surplus.

This problem is to be attacked in the two ways developed previously — by restriction and by storage. The provisions for restriction are embodied in the resolution accepted by the operators and are as follows:

"WHEREAS, the Governor of the State of California, through the Governor's Gas Conservation Committee, has called upon the operators in the Santa Fe Springs Field to prevent as far as possible creating and maintaining a surplus of natural gas in excess of that which can be put to beneficial use after being separated from the oil which has been produced by said gas, and

"WHEREAS, experience in the production of oil has demonstrated that a larger ultimate production of oil can be secured, and a greater conservation of gas effected, by flowing wells against a back pressure controlled by flow plugs or beans and

"WHEREAS, it has been demonstrated that natural gas performs a twofold function in producing oil; 1. By decreasing the viscosity of the oil occurring in the sands, and 2. By furnishing the energy necessary to bring the oil to the well and flow said well.

"THEREFORE, the Committee on Curtailment of Santa Fe Springs Gas Production recommends that a uniform practice of back pressuring in all wells in the Santa Fe Springs field be adopted for the purpose of conserving gas and materially reducing the amount of gas currently produced, so as to meet the demands of the Governor's Gas Conservation Committee and to increase the ultimate recovery of oil.

"In order to accomplish this in a manner fair and equitable to all operators and others owning wells or having an interest in the production of oil and gas therefrom, it is necessary that the procedure for gas conservation shall be uniformly accepted and followed by all operators.

"For this purpose the Committee on Curtailment of Santa Fe Springs Gas Production recommends to the operators of the Santa Fe Springs district the following plan of action:

"1. That all new wells completed at Santa Fe Springs be produced through tubing.

"2. That all wells be equipped with high pressure casing heads and fittings capable of withstanding 2000 pounds test pressure, or better.

"3. That, whenever the gas production at Santa Fe Springs exceeds the usages in the field and demands of the gas companies and demands of repressuring and storage projects so that an actual surplus exists, each flowing well producing from zones lower than the Meyer zone shall be pinched back by a percentage of its net oil production to be set by a Control Committee, to be appointed by the Santa Fe Springs operators; the percentage cut to be uniform and applicable alike to all such wells; that each new flowing well brought in from zones below the Meyer zone be allowed to produce normally for 15 days, and that thereafter each such well shall be pinched in at the end of 15 days the total percentage cut then in effect; that said percentage cut shall be applied on the average production of the well during the last five days of said 15-day period; that if any well subject to cut shall develop pressures or mechanical conditions which prohibit the entire percentage cut then due, the company possessing such well shall make additional cuts on other wells to obtain the equivalent barrelage cut due well in question.

"4. That the Control Committee may change the percentage of cut at its discretion whenever the conditions warrant, by adding addition-

*Standard Oil Co. of California.

al cuts or by reducing cuts already in effect, the same to be applicable alike to all wells.

"5. That the foregoing program shall be accepted in writing by all operators owning or operating wells in the Santa Fe Springs field.

"6. That upon acceptance of the foregoing plan, the Control Committee shall issue the necessary instructions to carry this program into effect at the proper time; that the operator of the field will furnish this Committee with the necessary information as to their daily production and other pertinent data asked for by said Committee and that this Committee is authorized to call upon and be furnished by all marketing companies, pipe line companies and others running or removing oil from the Santa Fe Springs field, oil runs to determine the deliveries of all operators in the field, for the purpose of establishing complete compliance with this program.

"7. That this program shall continue in effect for 90 days from the date set by the Control Committee for the beginning of the curtailment. If one month prior to the end of the 90-day period it appears to the Control Committee that the emergency will still exist at the end of the period, the Control Committee shall so notify the Santa Fe Springs operators in order that measures may be taken to extend the period."

It is anticipated that it will be very difficult to enforce this plan in full because the heart of Santa Fe Springs is a town lot field with a large number of small producers and a host of royalty holders. If successful, the plan will conserve both gas and oil as it has done at Ventura and greatly reduce storage requirements for oil above ground.

The plan for conservation by storage is a rather elaborate one. It contemplates storage in the Meyer zone (an upper zone) from which some 30,000 barrels of oil per day is now being produced by 28 different operators, some of whom have as many as a dozen different properties.

BRIEFLY the plan provides for the formation of a non profit association incorporated under the laws of the State of California, composed of all Meyer sand operators, the association to be known as Santa Fe Springs Gas Conservation Association. It is proposed that this association take over the business of repressuring the Meyer zone in all its details, operating under the direction of a board of directors elected by the association and a board of engineers appointed by the directors. The purposes of the association, as set forth in the by-laws, are:

". . . . to effectuate injection and storing in the Meyer oil zone of the Santa Fe Springs oil district surplus gas produced from other zones in the same district and other districts, to the end that such gas may later be withdrawn and applied to beneficial use; that a greater, more economical and more orderly recovery of the oil and gasoline content of said Meyer zone may be had, and, further, to effectuate a fair apportionment among the parties entitled thereto of the oil, gas and gasoline which may be obtained and recovered from said Meyer zone."

Membership in the association is open to all Meyer sand operators, each member's interest being that proportion which his Meyer sand production, as determined over a 90-day average, bears to the total Meyer sand production determined for the same period. This interest once assigned remains fixed and determines the proportion which each member contributes to the investment fund of the association and its operating expenses as well as such member's proportion in the proceeds and such interest is not lessened by wells taken off production for injection or wells shut in to control gas distribution. A member's interest in gas and gasoline production is determined in the same manner.

Since such procedure affects royalty interests, the consent of the lessor is desirable as a prerequisite to membership and a form of agreement is provided between lessor and lessee. It is not believed, however, that failure of the lessor to agree will prevent the operation of the plan.

One of the most interesting as well as most radical steps provided for in the plan is the assigning to the engineering advisory board the duty of determining the proper operating control of production to be used by each member on his wells. This in effect places the entire pool under one management and is probably the greatest forward step in cooperative operation so far contemplated.

If when the proposed plan is put into effect, increased production results, as is expected, operators in the higher structural parts of the field will produce more oil than they are entitled to by their respective interests, while operators in the lower portions of the field will receive less.

It is not planned to have the association physically handle and market such production but to act as a clearing house for adjusting the differences either in cash returns or in kind through credits and debits from the pipe line companies. It is unfortunate that this experiment in cooperative conservation will have to be carried out in a town lot field.

Winkler Operators Would Raise Their Production Limit

HOUSTON, Nov. 30

WINKLER county operators have asked the Railroad Commission of Texas to raise the limit of allowable production from 150,000 to 175,000 barrels daily in their prorating division of the Permian salt basin region. Permitted production has been 150,000 barrels since Oct. 1, when it was reduced from 175,000 barrels.

Two reasons are given for the request: (1)—that excessive pinching of wells created by reason of increased potential production has carried back pressures beyond the point of retarding water and brought them to the place where encroachment increases; (2)—that developments in the Leck and O'Brien areas, north and south respectively of original Hendricks production, make a larger allowance desirable.

The request is in conflict with a resolution previously adopted by Yates field operators of Pecos county, who asked the railroad commission not to grant further increases in allowable production from Permian salt basin fields; but, in case of any such increase, that Yates operators be given priority.

Yates operators pointed to the larger potential production of their field and its smaller allowance in comparison with the Winkler area. Yates field allowable production continues at 72,500 barrels daily.

The Yates field potential approximates 25 per cent more than the potential accredited to the Winkler area.

A well of Amerada Petroleum Corp., in Sec. 3, block 74, northern Winkler county, extended the Leck producing area a quarter of a mile northeast this week. It was No. 1 Daugherty, in the northwest corner of the southeast quarter, good for estimated initial production of 4000 barrels daily at 3152 feet.

The Amerada well and earlier completions in the Leck area are nine miles north of original Winkler county production on the Hendricks ranch.

A report from San Angelo says the B-1 University deep well of the Texon-Group 1 companies, in the heart of the Big Lake field, Reagan county, found another pay at 8482-8510 feet, testing 43 A. P. I. gravity oil. The well has been carrying oil in the hole from a pay previously found at about 6300 feet.

The 8500-foot pay is described as being in a dark sand, irregular and worn at the edges. This test became the deepest in the world several months ago, when, at about 8200 feet, it passed the depth record of the No. 96 Olinda of the Chanslor-Canfield Midway Oil Co. in California.

Our Industry—A Page of Facts and Personalities

By Paul Wagner

National Petroleum News

Houston, Texas

The governor-elect of New Jersey, Morgan F. Larsen, also classifies as a Texas oil operator. He is associated with J. E. Walsh in Caldwell county operations, near Luling, and in the development of the Refugio gas field, near Corpus Christi. Messrs. Larsen and Walsh have been friends and associates for years.

* * *

An industrial survey conducted by the West Texas Gas Co., subsidiary of the Prairie Oil & Gas Co., sets up an outlook for 35,000 population in Odessa, Ector county, within the next eight and a half years. John Thompson, sales manager of the company, attributes the future growth he forecast to oil and potash development in the Permian-age salt basin region of west Texas and southeastern New Mexico.

* * *

W. D. Cope, individual oil operator of Tulsa and Fort Worth, has opened west Texas offices at Midland. He will use that thriving city of the south plains country as a base for Permian salt basin activity.

* * *

A pioneer in Laredo district oil development has been re-elected president of the South Texas Chamber of Commerce. He is O. W. Killam, producer and refiner, who makes Laredo his headquarters. In addition to operating in the oil fields of Webb and Zapata counties, Texas, Mr. Killam is president and principal owner of the Misko Refineries, Inc., with plant at Mirando City.

* * *

Plans are being carried forward in the organization of a petroleum club at San Antonio. P. H. Swearingen, attorney for the Southern Crude Oil Purchasing Co., has been instructed to take steps looking toward the club's incorporation and quarters in the Milam building have been approved. First directors of the club are Dr. F. L. Thomson, head of the Grayburg Oil Co.; C. A. Campbell, San Antonio division manager of the Milham Corp., subsidiary of the Mexican Seaboard Oil Co. of Maine; Sam L. Kone, president, Kone Production Co.; F. P. Zoch, independent producer, of San Antonio and Fort Worth; William F. Morgan, general manager of the Southland Gas Co.

CAPT. J. F. LUCEY

Two oil men active in the sweep of the national Republican broom through Texas are being prominently mentioned for places in the cabinet of President-elect Herbert Hoover. They are Capt. J. F. Lucey, president of the Lucey Petroleum Corp., Dallas, and T. P. Lee, oil, financier-operator, Houston.

Capt. Lucey worked with Mr. Hoover as an engineer in Shanghai, 25 years ago. Later, he was associated with the president-elect when he was food administrator in Europe at the time of the World war. Mr. Lee has been a Republican leader in Texas for years, ranking with R. B. Creager of Brownsville in that regard.

It is told of Capt. Lucey that he called at Mr. Hoover's office after he had been installed as Secretary of Commerce by President Harding.

"This doesn't look like the White House to me," the Captain is quoted as saying.

"Well, it is as far as you got me," the then Secretary of Commerce is said to have replied.

Capt. Lucey was one of a group that worked unsuccessfully for Mr. Hoover at Chicago, in 1920, when Harding was nominated.

* * *

Dr. H. Jenny of the geological force of the Compania de Petroleo de Holandesia "La Corona," S. A., returned to Tampico in November after a three months' vacation trip to Europe, including a visit to his native Switzerland.

Charles H. Dickey, who was recently elected president of the Pacific Coast Gas Association, has been associated with the industry for more than 35 years. He is vice president and a director of the Southern Counties Gas Co., at Los Angeles; director of the Pacific Lighting Co., and the Pacific Gas & Electric Co.

* * *

H. E. Fowler, formerly chief chemist at the Texas City plant of the Pierce Oil Corp., which has been closed down for more than a year, is now stationed at Tampico for the Pierce interests. He replaces Dr. H. C. Lohman, who resigned as chief chemist at Tampico.

* * *

F. D. Connolly, formerly auditor at Tampico for The Texas Co. of Mexico, S. A., is now stationed at Rio de Janeiro, Brazil, under transfer by the parent organization, The Texas Corp. Friends may address him in care of the company at Apartado (Postoffice Box) 520.

* * *

The Humble Club, an inter-office organization at Houston headquarters of the Humble Oil & Refining Co., is sponsoring an evening class in accounting through its educational committee. Gay Carroll is acting as instructor. The educational committee is composed of J. K. Vaughn, E. L. Fitzgerald, C. D. Voss and J. R. Mulvey. In stating that increased interest in the work is being shown from year to year, Mr. Carroll adds this educational movement has passed the experimental stage.

* * *

J. M. McMillan, Jr., for three years a geologist of the Empire Oil & Refining Co., is now stationed in the Eldorado, Kan., district, for the Skelly Oil Co., Tulsa. Earl A. Trager, formerly of the Marland Companies and later associated with the Ponca City engineering firm of Earl Oliver & Co., is Skelly's chief geologist.

* * *

When Edgar B. Davis, discoverer of the Luling oil field, undertakes a task he sees it through. It was thus in the beginning at Luling. First disappointments did not dismay him and he was finally rewarded with success. Later he sold his company's oil rights above 3000 feet at Luling to the Magnolia Petroleum Co., for $12,100,000. His company, principally owned by himself, later drilled two exploratory tests to depths below 7000 feet, in schist, before

abandoning. Then Mr. Davis turned his attention to other things. He backed a New York play, dealing with the doctrine of reincarnation, at a reported cost to him of $1,300,000. When the public appeared not interested, Mr. Davis dispensed with admission prices and gave away tickets. The play, known as "The Ladder," ran for two years in New York, from October, 1926, until its recent transfer to Boston.

* * *

Ross S. Sterling, Houston city builder and one-time executive head of the Humble Oil & Refining Co., is backing a road building campaign that promises material development in the Texas consumption of petroleum products. As chairman of the state highway commission, he has suggested a $350,000,000 bond issue, covering a period of 10 years, on the "pay as you ride" plan. Financial requirements of the project would be met by a 3-cent gasoline tax instead of the present 2-cent tax. All but one-quarter of the tax, which goes to the school fund under constitutional provision, would apply to highway construction. Texas oil men are supporting the project in principle but reserving specific indorsement in order that they may not be embarrassed by political variations of the plan that conceivably might crop out in the 1929 legislature.

* * *

Clay M. Reynolds, veteran producing department employee of the Standard Oil Co. of California went home for dinner with his drilling foreman, C. E. Sitzman. He had rounded out exactly 40 years of service. To his surprise, Reynolds found the entire Newhall division, including their families, had taken possession of his house and were there to do him honor.

* * *

W. L. Mackenzie of the International Petroleum Co., in Peru, has returned to South America after visiting Petrolia, Canada, Stockport, England, and New York. He was accompanied by Mrs. Mackenzie and their youngster.

* * *

Albert O. Pegg, superintending engineer for the Union Oil Co. of California has been appointed a member of the committee on engineering of the technical committee of the American Bureau of Shipping.

* * *

J. D. Moore, formerly Pure Oil Co. production foreman in the Lawson area of south Arkansas, has been transferred to the Little River, Oklahoma, district of the Greater Seminole territory.

* * *

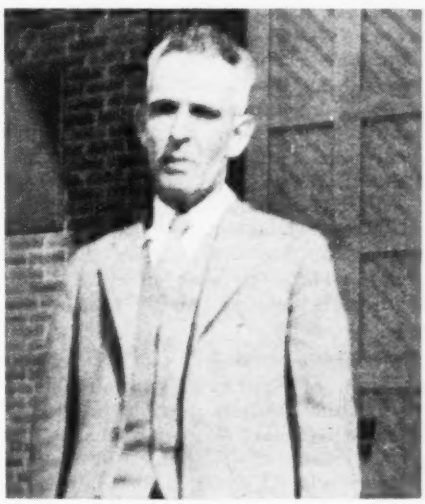
W. H. (Bill) Francis, vice president and general counsel of Magnolia Petroleum Co., Dallas, subsidiary of Standard Oil Co. of New York, spent his vacation in the Rocky Mountain region.

With the exception of the man "wearing a pipe" at the right, the accompanying group picture shows members of the Texas organization of the California Co., subsidiary of the Standard Oil Co. of California. The man at the right is A. S. Palmer, production department manager of the parent company at San Francisco.

From left to right, others shown in the picture are Fred Winger, assistant superintendent of production in the Yates field, Pecos county; Hedger Smith, production superintendent in Mitchell county; William Simpson, general superintendent of Texas production, with headquarters at Colorado City; Warner Clark, southern division manager at Dallas; A. V. Lane, purchasing agent, Dallas.

* * *

John T. Vinson has been installed as warehouseman at St. Louis, Okla., by Magnolia Petroleum Co., under Supt. J. W. Tipton.



J. P. CUSACK

J. P. Cusack, in charge of the Skelly Oil Co.'s land and leasing affairs in Texas, was transferred from Tulsa when the Fort Worth office was opened more than a year ago. He is widely known in the Mid-Continent petroleum industry.

C. E. McGrew of the Magnolia pipeline organization south of Corsicana has been transferred to Kings Mill, in the Texas Panhandle district.

* * *

James O. G. Sanderson is now at 602 Second St., Calgary, Alberta, Canada, for Imperial Oil, Ltd. Until resuming his geological work he had been at the Royal Ontario Museum of Paleontology, at Toronto.

* * *

William Groundwater, manager of transportation, Union Oil Co. of California, has been re-elected member of the executive committee of the Marine Service Bureau of San Pedro, an affiliated organization of the Shipowners' Association of the Pacific Coast.

* * *

James Mobley of the East Coast Oil Co. of Mexico, S. A., Southern Pacific subsidiary in the Tampico district, spent his vacation at San Antonio and elsewhere in Texas.

* * *

L. H. McNaughton, formerly of the Humble Oil & Refining Co.'s geological staff in East Texas, is now with the Rycade Oil Co. at Houston.

* * *

R. B. Kester, field superintendent of the Transcontinental Oil Co. in the Cacalillao, Mexico, district, is spending his vacation in the United States. He went first to St. Louis, with the intention of then proceeding to his old home at Petroleum, West Virginia.

* * *

George D. Morgan, who was recently elected a vice president of the Dixie Oil Co., Inc., direct producing subsidiary in the southwest of the Standard Oil Co. of Indiana, is in executive charge of the land and geological departments at Shreveport. He formerly lived at San Antonio.

* * *

J. B. Johnson, purchasing agent of the Tidal Oil Co., at Tulsa, spent his vacation in the Rocky Mountain region.

Oklahoma City Wildcat Has Oil Show

New Peak in St. Louis

By Lawrence E. Smith
N. P. N. STAFF WRITER

TULSA, Dec. 1

A SHOWING of oil in the important wildcat just south of Oklahoma City; a new high mark in production for the St. Louis pool, Pottawatomie county; further evidence that the pool opened in 5-7-7E, east of the Little River field, will be quite small, were outstanding events in the week.

The Oklahoma City wildcat for some time, has been looked upon as the outstanding attempt to open new territory in Oklahoma. Its distance from other or previous production is one thing that sets it apart and its great depth gives it an unusual aspect.

The well is in the center of the SE SE of 24-11N-3W, about six miles south of Oklahoma City's business center. It is being drilled by the Indian Territory Illuminating Oil Co. and the Foster Petroleum Co., both of Bartlesville, Okla. The "Territory" company has been so successful in wildcatting in the past three years, having opened both the Bowlegs and Little River pools, that something of the same tradition of good fortune attaches to it as has long been the reputation of Thomas B. Slick.

The test has total depth of 6402 feet. Six-inch casing was set and cemented at 6335 feet and the rig standardized. When the concrete plug was drilled through, the tools were blown up in the hole by the gas which had accumulated and the hole bridged. In trying to pull out the tools the wire line broke and a fishing job is in progress.

Presumably the formation which is immediately ahead and which is making the gas and oil is the Simpson, in which member is found the Wilcox sand, prolific producer elsewhere in Oklahoma. There is no way of telling how much oil there is in the hole. Samples which have been caught are of 39 A. P. I. gravity. Further drilling only will tell the story.

The same test has kept observers on edge for weeks. At 3996-4233 feet an estimated 25 million feet of gas daily was found and at 4793-4816 feet another gas sand making about 40 million feet daily. Cores of this latter formation showed rich saturation with oil. It is presumed to be the Layton sand.

The St. Louis district, still one of the most active in the Mid-Continent, made a new high mark in its production Nov. 30, when a total of 134,612 barrels was produced. It was also a new peak of production for the Wilcox sand part of the field, this total being 92,754 barrels. The rest of the production comes from that part of the Simpson formation which lies above the Wilcox and from the Hunton lime, including the original Pearson Switch pool.

The field's record by leases is as follows:

Company	Lease	Loc.	Wells	Prod. Nov. 30	Prod. Nov. 23
Barnsdall	Stahl	30-7-5	2	1,797	2,028
Gypsy-Sinclair	Stahl	30-7-5	5	12,072	12,128
Phillips	Stahl	30-7-5	2	off	1,388
Sinclair	Blandin	24-7-4	2	4,815	None
Sinclair	Nadash	20-7-5	1	280	295
Magnolia	Hembree	19-7-5	4	6,319	7,718
Magnolia	Youts	20-7-5	5	7,839	6,817
Magnolia	C. A. Youts	20-7-5	2	700	800
Magnolia	T. Fyke-A	20-7-5	1	153	109
Magnolia	T. Fyke-B	20-7-5	1	3,864	4,308
Magnolia	Cherry-A	26-7-4	1	4,412	2,471
Slick	Hembree	19-7-5	4	15,007	15,750
Slick	Youts	19-7-5	2	1,440	1,800
Mid-Continent	Guinn	20-7-5	1	890	150
Pure Oil	Thomas	26-7-4	1	3,675	4,085
Independent	Youts	19-7-5	8	20,700	21,240
Prairie	Wolf	20-7-5	4	3,725	3,845
Roxana	Smith	21-7-5	1	556	.....
Shaffer	Cherry	23-7-4	1	80	.....
Texas	Cherry	25-7-4	1	3,370	4,500
Total			49	92,754	89,432

The gain in production was due, in the main, to application of air lift to wells that had been drilled in several days before the peak was made. Notable among this class was the Sinclair Oil & Gas Co.'s No. 13 Blandin, in the SW corner of 24-7-4, earlier an apparent failure. A streak of water was found in the upper part of the Simpson, but this was passed and the pay found underneath. The well swabbed about 350 barrels per day but on air lift made a high of 3400 barrels. The east offset, No. 12 Blandin, is making about 1400 barrels.

It looks as though the southwest extension of St. Louis, lying in Twp. 7-4, would continue to yield wells which will make large producers by air lift method. A half mile south of the Sinclair Blandin wells, however, a Wilcox failure was drilled by the Mid-Kansas Oil & Gas Co., in the SW NW of 25-7-4. A hole full of water was the result at total depth of 4415 feet. It is a diagonal southeast offset to the Magnolia's No. 1 Cherry well, which is making better than 4000 barrels on air lift. All of which proves merely that this territory is as eccentric as any of the Seminole area.

Some weeks ago the Mid-Continent Petroleum Corp. opened a pool, or extension to the main St. Louis pool, in 20-7-5, east of original Wilcox production. Its No. 1 Guinn made 3300 barrels maximum. The east offset to it is a virtual failure, this being No. 2 Guinn, in the SE NE of 20-7-5. At total depth of 4380 feet it is making 15 barrels of oil and 250 barrels of water. The No. 1 Guinn is down to around 900 barrels daily.

For several months the Mid-Continent Petroleum Corp. held in leash its No. 1 Smith well, in the NW NE of 5-7-7, a mile and a half east of the eastern limits of the Little River pool. When finally turned loose by expiration of a producers' agreement, the well made upward of 3000 barrels daily for a time. Several other wells were started and the crop is about harvested. It looks like a one-well pool.

Recent developments include the Mid-Continent's east offset to its discovery, which had the Wilcox at 4486-91 feet and swabbed 470 barrels in 24 hours. It will make a much better well on air lift, no doubt. Other happenings, however, are not that bright. The Shell Petroleum Corp. drilled its No. 1 Jeffreys, in the NE SE SW of 32-8-7, a quarter mile from the discovery, into Wilcox sand at 4475 feet, getting a hole full of water and its No. 2 Jeffreys, SE SE SW of 32-8-7, diagonally offsetting northwest the discovery, into the Wilcox at 4535 feet, getting 2300 feet of water and 200 feet of oil.

Directly offsetting the discovery to the west is the Prairie Oil & Gas

Co.'s No. 1 Lustey, NE NE NW of 5-7-7. It had the Wilcox at 4633 feet and at 10 feet in swabbed 155 barrels of oil and lots of water. And to make it look more conclusive, Magnolia Petroleum Co. stepped out a half mile east and a half mile north of the discovery for another failure. This was the No. 1 Sissue, SW SW NW of 33-8-7, where Wilcox was drilled from 4332-36 feet and nothing but water resulted.

A little additional ground was proved on the west edge of the Searight pool by the Mid-Continent Petroleum Corp., when its No. 2 Nevins, NE SE SE of 32-10-6 made a well. Wilcox was found at 4333-44 feet and shot with 20 quarts. The well made a high of 1075 barrels. It had been producing about 300 barrels per day before the shot and this betterment of performance has encouraged the company to make locations for the east and west offsets to the well.

In Twp. 8-5, northern part thereof, due west of the Mission pool of present activity, is the Misener sand pool opened several weeks ago by the Pure Oil Co., whose No. 1 Lindley, SE SW SE of 18-8-5, has quite a "kick," as evidenced by its performance of 2536 barrels when given wide open test on Nov. 30. Directly offsetting it to the east, Gypsy Oil Co.'s No. 1 Miller in the SW SE SE of 18-8-5, topped the Misener at 4126 feet and at one foot in made 10 million feet of gas, estimated. No oil accompanied the gas and the well is being drilled deeper.

Two locations west of the discovery, the Prairie Oil & Gas Co.'s No. 1 Campbell, SE SW of 18-8-5, topped the Misener at 4198 feet and at one foot in swabbed 142 barrels in 24 hours, with a little water. An important Wilcox test in this region is that of the Amerada Petroleum Corp. in the NE NE SW of 8-8-5, whose No. 1 Gossland was a Misener sand producer. The well is drilling in Sylvan shale, from which it made several flows of oil. Currently, it looks in line to open a Wilcox pool.

In Logan county, Oklahoma's deepest producing field, Sinclair Oil & Gas Co. effected an extension of one location to the northern limits of the pool with its No. 2 Peter Weber, NE SE SE of 18-19N-4W. Wilcox sand was topped at 6094 feet and at 31 feet in the pay the well made 3200 barrels on Nov. 29 and 2800 the following day. It is the largest initial production well yet drilled in the field. In this 19-4 area there are 18 wells drilling, the majority of them by the Shell Petroleum Corp., which opened the field. In the township next south, where production is found in thin sands around 4000 feet, there are five wells drilling.

Earlsboro was given a quarter mile extension to its southeast part when the Magnolia Petroleum Co.'s No. 1 Gillam, NW NE SW of 13-9-5, swabbed and flowed 1843 barrels as its high 24-hour figure.

The Burbank pool was given a one-half mile southeast extension and the coming Osage sale helped out by the Carter Oil Co., whose test in the NE SE of 23-26-6E is making about 60 barrels daily from sand topped at 2887 feet. The Burbank field needs a boost, as its decline this year has been severe. On Feb. 29, the field produced 44,210 barrels from 2049 wells and on Nov. 22 it made 25,800 barrels from 2111 wells.

Sedgewick county, Kans., new pool north of Wichita got its second well early in the week. No. 1 Lyon, drilled by the Bu-vi-bar Petroleum Co. (J. Garfield Buell and others) on acreage held by the Marland and Gypsy companies, made 1800 barrels in its first 24 hours after hitting the pay at 3352 feet. It is now four feet in the sand. It is an east offset to the No. 1 Wright, discovery well, which is still making around 1400 barrels although more than four months old. The oil is 43 gravity. Marland owns five-tenths of the acreage in the large block around the wells, the Gypsy four-tenths and the Bu-vi-bar one-tenth. Marland will lay a pipe line to the field. The No. 1 Lyon is in the SW NW SW of 7-26S-1E. In this area, Fisher & Lauck have a failure in their No. 1 Strickland, SE NW SE of 18-26S-2E, which got the top of a sand at 3400 feet and found only sulfur water. Other Kansas operations were without feature.

Notes on the Week

T. B. Slick has a failure in the Maud pool, southwest of the Mission pool operations, in the NW SW SE of 13-8-5. Wilcox sand was topped at 4412 feet and was 68 feet thick. Total depth was 4483 feet. The hole filled with water.

* * *

Carey et al., on Producers & Refiners Corp. acreage, improved No. 1 Monarye, NW NE SE of 29-12-10E, Okfuskee county, by drilling deeper. This well proves a little new territory. It came in several weeks ago and had fallen to 700 barrels daily. It was deepened five feet to 2937 feet and increased to 1320 barrels in 24 hours.

* * *

Northeast of Wewoka, Pure Oil Co.'s important wildcat in the NE SW of 18-8N-9E, Hughes county, is a Wilcox failure. The top of that sand was found at 4426 feet.

* * *

Limestone Oil & Gas Co.'s wildcat in Latimer county, away off southeast of production and in the vicinity of Wilburton, Okla., is making about one and one-half million feet of gas from a sand at 2518-22 feet. Tools are in the hole, 1000 feet off bottom. Location is the SW corner of 15-5N-18E.

Woods county, one of the northwest counties of Oklahoma and a long way from production, is to get two deep tests. George Vincent and others will drill in the center SW of 11-28N-18W. Bu-vi-bar Petroleum Co. and others will put down one in the SE SW of 10-25N-15W. Rig is on the ground.

In Woodward county, adjoining Woods, the deep test of the Prairie Oil & Gas Co. and Transcontinental Oil Co., in the NE NE NE of 23-23N-17W, is shut down for boiler repairs at 3177 feet. H. L. Blackstock, the contractor, has been having plenty of trouble on this one. Water is bad and thus far he has ruined three boilers.

* * *

Skelly Oil Co.'s No. 4 Armstrong, in Moore county, Texas Panhandle, has been shot with 15 quarts at 3162-82 feet and started off at 60 barrels per hour. Skelly has much acreage in this region and when times become propitious there will be considerable of a campaign by them and others in the region.

* * *

A test that is being watched with interest is that of the Sunray Oil Corp. in the northwest extension to the Allen pool, Pontotoc county. The test is drilling to the Wilcox and at the end of the week was at 4009 feet with the Wilcox expected around 4100 feet. It is three locations south of the Sinclair Oil & Gas Co.'s well which proved the Wilcox oil bearing in this pool several months ago. The Sinclair well started off at the rate of 800 barrels daily and was then restricted to 50 barrels per day to keep down drilling. The Sunray well is in the SE SW SW of 7-5-8E.

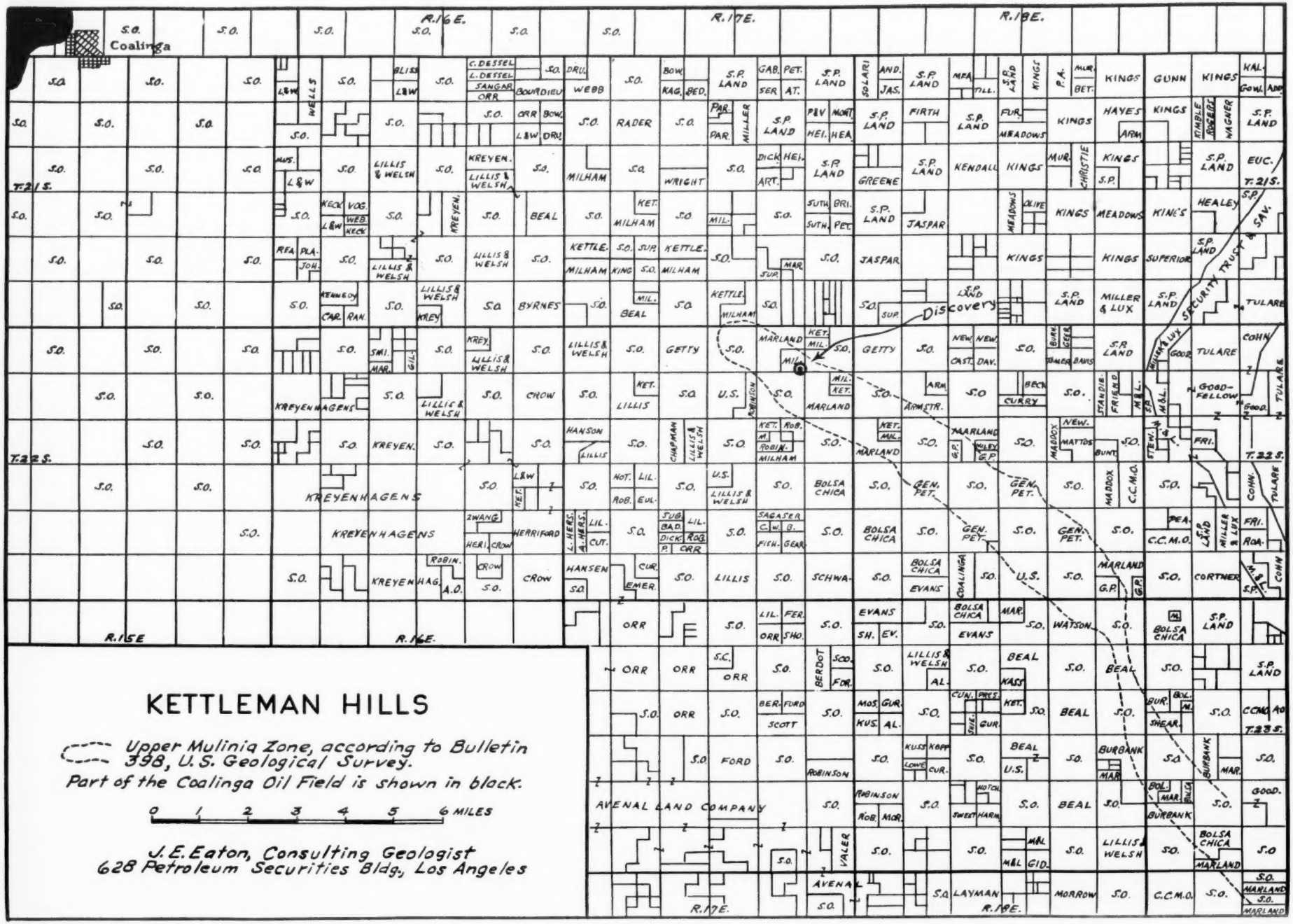
* * *

Attempt of T. B. Slick to find something under the Wilcox in Tonkawa was not successful. His No. 1-E Endicott, NE SW SW SW of 35-25-1W, an old well deepened, found top of the siliceous lime, below the Wilcox, at 4293 feet and a pay streak at 4400-4405. It swabbed 50 barrels of oil and 10 barrels of water.

Petroleum Exposition For 1929

TULSA, Dec. 1.—President William G. Skelly, of the International Petroleum Exposition, announced today that the board of directors had decided to hold an exposition in 1929. A vote was taken on Nov. 8, with a majority of those present voting to hold the show, but because several were absent a questionnaire was sent out to all. The vote in favor of the show is nearly unanimous.

The New Kettleman Hills District in California



60 Gravity Crude Coming from 7000 Feet In California's Newest Oil Field

By W. E. Green
N. P. N. STAFF WRITER

LOS ANGELES, Nov. 30

KETTLEMAN HILLS, in Kings county, Calif., is a proved oil field, with its first well making 4000 barrels of 60 gravity oil, in addition to at least 45,000,000 cubic feet of gas daily.

It is believed there is little opportunity for the field to have any real effect on the production of the state for at least a year. Production in 12 months is not expected to exceed 20,000 barrels daily.

The majority of the acreage is held in large blocks by responsible operators. This, with the great depth at which this tremendously high gravity crude is found, may be expected to result in conservative development of this territory. The first well in the field is producing from below 7000 feet.

For more than 20 years various oil companies and individuals have been drilling for oil in this region, but no hole was ever drilled to a sufficient depth to penetrate the paying oil and gas formations.

Milham Exploration Co., a subsidiary of the Mexican Seaboard Oil Co., is the owner of a well, which blew out and ran wild for a few days, coming in as a gasser Oct. 6. It had been drilled to a total depth of 7236 feet, when the hole was lost. In redrilling, the blowout came when 7108 feet had been reached.

The well made gas only for a few days. Then it was noted the gas wet. Soon thereafter it started spraying some oil, of extreme high gravity. A recent analysis of the oil indicated it contains 63 per cent gasoline, 26 per cent kerosene and 11 per cent light gravity fuel. It has a combined paraffin and asphalt base, with asphalt predominating. The oil when removed from the tanks has a gravity of 59.2, A.P.I. corrected to 60 degrees temperature. It comes from the well with a temperature of about 66 to 68.

This well is also making at least 45,000,000 cubic feet of gas, with a natural gasoline content of two gallons to the 1000 feet, although none of the gas is being saved. The Texas Co. is now erecting a natural gasoline plant on the lease which should be in operation at Jan. 1.

The present flow from the well is through five Trumble gas traps and they are overloaded, indicating that the gas production is greater than estimated, but the owners are trying to be conservative in the figures they make public.

Steel storage tanks have been erected on the lease and Standard of California laid a three-inch pipe line from the lease to a nearby public road, where loading racks are used to load tank trucks, and the oil is hauled to Coalinga.

General Petroleum Corp. is laying a six-inch welded pipe line to the field, a distance of 35 miles, and this line probably will be in operation within a week or ten days. It would have been completed earlier, but welders are scarce.

The Kettleman Hills structure is about 22 miles in length, and contains three known domes. The discovery well is on the north dome. The middle dome is some six miles southeast of the new well, while the south dome, not so pronounced as the other two, lies on the southeast edge of the structure. There is a valley between the town of Coalinga and Kettleman Hills, and the hills start in Kings County.

Some 30,000 acres, owned in fee by Standard of California, are located on the hills, and there is much difference of opinion as to the probable acreage that may prove productive. The Standard's acreage was secured when this company purchased the old Pacific Oil Co., which, in turn, secured the land from the Southern Pacific when the oil business of the railroad was divorced from the railroad properties.

In fact, Standard Oil now owns in fee alternate sections throughout the area, which in later years, if the field proves to be very large in extent, may force the drilling of many offsets.

Others holding leases in Kettleman Hills include Marland Oil Co., General Petroleum Corp., Milham Exploration Co., Associated Oil Co., Miley Oil Co., Chanslor-Canfield Midway Oil Co., Bolsa Chica Oil Co., Bankline Oil Co., Superior Oil Co., Geo. F. Getty and a number of others holding small blocks. The accompanying map shows lease holders, discovery well, a prominent fossil zone which it is believed outlines the more valuable territory and indicates the location of Kettleman Hills with reference to the Coalinga oil field.

A number of holes have been drilled in Kettleman Hills during the past 20 years but it now develops that the holes were not drilled to a sufficient

Geological Aspects of Kettleman Hills

Discussed by J. E. Eaton, Geologist, Los Angeles

"THE Kettleman Hills comprise the largest and theoretically most nearly perfect anticline in California involving Cenozoic rocks. The anticline appears to be composed of at least three domes which have been arranged en echelon as a result of differential horizontal movement. It is underlain by some 3000 feet of Monterey (Miocene) sandstones and organic shales which are capped in turn by about 4000 feet of Pliocene sands and clayey sand. The drainage area can hardly be less than 150 square miles, a figure which is much larger than that of Long Beach, Santa Fe Springs and Ventura Avenue combined.

"The almost perfect sealing of the oil at Kettleman Hills necessitates abnormally deep drilling. This sealing has apparently prevented the usual upward migration of petroleum which is so pronounced in California fields, and has to a large extent confined the oils to the Miocene rocks in which they originate.

"Most of the acreage is held in rather large blocks. This feature, together with the great depth to production, will doubtless result in conservative and efficient development considering the very large territory which may be productive."

depth. In the early days 7000-foot holes were unthought of. The deepest previous hole was drilled by General Petroleum to 6766 feet, and then shut down on account of mechanical troubles. This hole is now being cleaned out to be drilled deeper.

Marland drilled a hole to 5679 feet and Superior Oil drilled to 4594 feet, where the drill stopped. Associated Oil drilled a well to 2043 feet and Coalinga Lakeview Oil Co. was also credited with an early hole to 3500 feet. Bolsa Chica drilled two holes, one to 3502 feet and the other to 3104 feet. Another hole was drilled on the McGlashman tract to 5001 feet, these being considered deep wells when they were drilled.

Standard Oil has made two locations offsetting the present producing well, and Geo. F. Getty made a location the past week on Sec. 6-23-17. Miley Oil Co. will drill a well on one of the Miley tracts, and Marland is expected to start at least one well within a few weeks.

Due to deep drilling, great cost of the holes and barren area none of the companies holding acreage are in a hurry to start work. It has been estimated that it will require around nine months to drill a well to completion below 7000 feet, if no unusual trouble is had. Bad fishing jobs and other troubles can string out the completion time to a year.

The development work of the Milham Exploration Co. at Kettleman Hills has been under the supervision of P. M. Longan, general manager of the Mexican Seaboard, who spends most of his time in California; C. E. Taber, resident manager of Milham Exploration; C. H. Doane, geologist, and N. A. Rousselot, in charge of drilling operations.

The potential value of the Kettleman Hills has been recognized by many geologists. Geological credit for inaugurating the particular campaign which led to the discovery is given to Willard W. Cutler and Paul P. Goudkoff, who worked the hills in 1923 and urged the Milham Exploration Co. to make the test which has proven successful.

New Potero Field Well Blows In With Big Flow of Wet Gas

Staff Special

LOS ANGELES, Dec. 1

THE spotlight jumped from Santa Fe Springs and other fields for a time Nov. 29, when Associated Oil Co.'s Cypress No. 3 of the Los Angeles city limits staged a blowout during a casing test, ran wild for a time, seriously injured three men, showed a tubing pressure of 1000 pounds and a casing pressure of 1300 pounds before being controlled.

The well flowed at the daily rate of about 1000 barrels, mostly mud, with some oil, and made 14,000,000 cubic feet of wet gas.

This well had been drilled to 4650 feet and a string of 9-inch was cemented at 3640 feet.

The great pressure was a surprise, and the fact that the gas is very wet was also encouraging. The well was soon brought under control and after a liner is run into the hole, it will be placed on a real production test.

The blowout wrecked a portion of the fittings. One man suffered a possibly fatal injury as a piece of steel struck him in the stomach. The other two men were severely injured, but are expected to recover.

Almost every large company official has a different idea about what is likely to happen at Santa Fe Springs within the next 60 days, but many are of the opinion that after some 25 additional wells are completed, the production decline will be rather sharp. In fact, at least three wells are showing marked declines already, although not more than two weeks old. One well for a few days declined at the rate of 100 barrels a day.

If the wells continue to act in this manner, some producers believe the peak of production can be expected early in January, and they do not think the peak will be 300,000 barrels a day by any means. It has been found that the Buckbee zone is not to exceed 150 feet in average thickness, and may not extend to the entire field. The intermediate zone, just above the Buckbee, is also about 150 feet thick, with plenty of gas in both zones. Many operators are planning to develop the intermediate zone first and later drill to the Buckbee.

Daily production Nov. 30 was estimated at slightly more than 70,000 barrels at Santa Fe Springs and it is expected that within two weeks, the daily average will be at least 100,000 barrels. Early this week, 230 wells were drilling, with a large number around 5000 feet or deeper.

Two wells were completed recently at Ventura Avenue around 7000 feet. One well made 700 barrels and another about 500 barrels. Both wells showed a heavy gas pressure and further work probably will increase production at both wells. Forty-five wells are drilling in this field.

Only three wells were completed in November at Seal Beach, two by Marland and one by Standard. Standard's San Gabriel No. 10 started out making 2300 barrels at 5450 feet, after being deepened. The other two wells started out with rather small flows, although as the month was drawing to a close another Marland well gave great promise.

No startling completions were reported at Long Beach. It is expected that the daily average production will show a decline. Several new locations have been made and drilling activity can be expected to continue for several months. Operators are making an effort to produce from the deeper zones, cementing off the upper sands which had been on production for many months.

Seminole Production by Companies and Leases, November 28 and November 21, 1928

LITTLE RIVER

Company	Farm	S.T.R.	Nov. 28 Wells	Nov. 28 Prod.	Nov. 21 Wells	Nov. 21 Prod.
Amerada	Nitey	2-7-6	3	840	3	855
Amer.-Wilcox	Fore	35-8-6	2	255	2	275
Total Amerada			5	1,095	5	1,130
Barnsdall	Cotcha	23-7-6	2	920	2	1,030
Barnsdall	Hotulka	22-7-6	2	184	2	338
Barnsdall	Walker	4-7-6	1	440	1	450
Total Barnsdall			5	1,544	5	1,818
Blackwell	Baker	11-7-6	4	985	4	515
Blackwell	Nitey	35-8-6	6	1,299	6	1,551
Blackwell	Talley	14-7-6	4	900	4	1,165
Total Blackwell			14	3,184	14	3,231
Bryan-Emery	Walker	4-7-6	1	13	1	13
Carter	Cotcha-M	23-7-6	3	95	3	265
Carter	Cudjo	36-8-6	1	250	1	205
Carter	Fish	36-8-6	4	425	4	480
Carter	Harjo C	11-7-6	3	5,352	3	5,842
Carter	Harjo M	13-7-6	2	805	2	892
Carter	Jackson	11-7-6	4	1,417	4	1,580
Carter	Larney	24-7-6	3	1,540	3	1,580
Carter	Lena	10-7-6	1	730	1	790
Carter	Moore	11-7-6	2	480	2	350
Carter	Tewee	14-7-6	6	3,656	6	3,588
Carter	Thomas	11-7-6	1	320	1	350
Carter	Wilson	12-7-6	2	505	2	537
Total Carter			30	15,454	30	16,459
Champlin	Tewee	14-7-6	2	1,750	2	1,767
Continental	Cosar	35-8-6	7	1,540	7	1,830
Continental	Cosar M	25-8-6	1	437	1	395
Cont. et al	Milsey	11-7-6	2	1,550	2	2,075
Total Continental			10	3,527	10	4,300
Empire	Charty	24-7-6	1	280	1	467
Empire	Coker	13-7-6	1	1,035	1	1,102
Empire	Sandlin	3-7-6	1	15	1	10
Total Empire			3	1,330	3	1,579
Gypsy	Brown C	33-8-6	2	275	2	625
Gypsy	Brown M	33-8-6	1	645	1	1,077
Gypsy	Campbell	33-7-6	2	32	2	45
Gypsy	Conard	22-7-6	2	670	2	757
Gypsy	Cosar	25-8-6	1	0	1	0
Gypsy	Cosar W	35-8-6	2	228	2	260
Gypsy	Cotcha	23-7-6	5	1,640	5	1,755
Gypsy	Denmark	11-7-6	4	2,617	4	2,915
Gypsy	Hulhoke	14-7-6	10	3,600	10	3,920

(Continued on Page 45)

Seminole Production by Companies and Leases, November 28 and November 21, 1928

(Continued from Page 44)

Company	Farm	S.T.R.	Nov. 28 Wells	Nov. 28 Prod.	Nov. 21 Wells	Nov. 21 Prod.
Gypsy	Mungee	1- 7-6	1	17	1	0
Gypsy	Pottie	35- 8-6	4	965	4	560
Gypsy	Renton	11- 7-6	3	627	3	657
Total Gypsy			36	11,316	36	12,571
Independent	Davis	13- 7-6	3	1,585	3	1,560
Independent	Tewee	14- 7-6	6	2,938	6	3,000
Independent	Williams	15- 7-6	1	580	1	655
Indep. et al	Harris	23- 7-6	8	2,171	8	2,272
Indep.-W. Eagle	Davis	3- 7-6	4	660	4	780
Total Independent			22	7,934	22	8,277
I. T. I. O.	Campbell	1- 7-6	1	159	1	154
I. T. I. O.	Dungan	35- 8-6	3	1,114	3	1,038
I. T. I. O.	House MA	1- 7-6	1	56	1	62
I. T. I. O.	House WE	1- 7-6	1	22	1	38
I. T. I. O.	House B	2- 7-6	4	576	4	619
I. T. I. O.	Hull	26- 8-6	3	521	3	543
I. T. I. O.	Jackson	1- 7-6	3	706	3	651
I. T. I. O.	McCulla	1- 7-6	3	409	3	447
I. T. I. O.	Nitey	1- 7-6	6	97	6	124
I. T. I. O.	Phoebe-A	36- 8-6	2	151	2	118
I. T. I. O.	Phoebe B	36- 8-6	3	135	3	97
I. T. I. O.	Reed	1- 7-6	1	21	1	26
I. T. I. O.	Soketheche	1- 7-6	3	517	3	538
Total I. T. I. O.			34	4,484	34	4,455
Magnolia	Cruse	2- 7-6	4	417	4	342
Magnolia	Denby	11- 7-6	3	1,502	4	1,584
Magnolia	Dixon	31- 8-7	1	1	1	2
Magnolia	Harjo A	14- 7-6	2	240	2	270
Magnolia	Harjo B	14- 7-6	2	728	2	768
Magnolia	Pottie	35- 8-6	4	516	4	550
Magnolia	Reed F	31- 8-7	1	35	1	35
Magnolia	Reed I	22- 7-6	3	800	3	856
Total Magnolia			20	4,239	21	4,407
McCulloch-Sands	Harrison	4- 7-6	1	52	1	54
Mid-Continent	Brunner	11- 7-6	4	1,225	3	1,345
Mid-Continent	Eleck	23- 7-6	1	40	1	280
Mid-Continent	Smith	5- 7-7	2	3,935	1	3,525
Mid-Continent	Wadsworth	36- 8-6	7	340	7	380
Total Mid-Continent			14	5,540	13	5,530
W. B. Pine	Hoyecha	26- 8-6	6	2,405	6	2,090
Pine-Phillips	Pottie	35- 8-6	2	310	2	360
Total Pine			8	2,710	8	2,450
Prairie	Chilcoat	25- 8-6	3	810	3	625
Prairie	Dungan	35- 8-6	1	35	1	0
Prairie	Gibson	14- 7-6	5	1,885	5	2,090
Prairie	Harris	14- 7-6	4	1,490	4	1,665
Prairie	House	2- 7-6	4	285	4	275
Prairie	Luste	5- 7-7	1	155	0	0
Prairie	Moppin	24- 7-6	1	390	1	380
Prairie	Talley	14- 7-6	4	1,500	4	1,698
Prairie & Amerada	Sunny	14- 7-6	8	4,805	8	5,305
Total Prairie			31	11,355	30	12,038
Pure	Brinson	24- 7-6	1	1,334	1	1,067
Pure	Cotcha	14- 7-6	9	3,686	9	3,487
Pure	Hario	11- 7-6	4	871	4	936
Pure	Hollins	11- 7-6	1	465	0	0
Total Pure			15	6,556	14	5,496
Reiter-Foster	Bunyard	14- 7-6	4	2,510	4	2,765
Roxana	Hotulke	23- 7-6	4	992	4	880
Roxana	Johnson	13- 7-6	4	3,184	4	2,730
Total Roxana			8	4,176	8	3,610
Shaffer	Narcome	36- 8-6	2	200	2	180
Sinclair	Cosar	30- 8-6	3	635	3	685
Sinclair	Haney	12- 7-6	1	37	1	30
Sinclair	Tewee	14- 7-6	2	1,640	2	1,770
Sinc. & Kingwood	Pompey	24- 7-6	1	140	1	200
Total Sinclair			7	2,452	7	2,685
Skelly	Carl	14- 7-6	2	1,486	2	1,670
Slick	Reed	13- 7-6	1	1,170	1	1,160
Slick	Williams	15- 7-6	2	485	2	406
Slick	Wood	26- 8-6	1	420	1	430
Total Slick			4	2,074	4	1,996
Snowden-McS.	Tiger	13- 7-6	3	1,470	3	1,492
Superior	Potulka	31- 8-6	1	5	1	5
Superior	Soketheche	1- 7-6	1	5	1	8
Total Superior			2	10	2	13
Texas	Brooks	25- 8-6	1	90	1	100
Texas	Coker	1- 7-6	3	450	3	520
Texas	Janey	11- 7-6	3	705	3	820
Texas & Indep.	Hotulke	23- 7-6	4	1,605	4	1,890
Total Texas			11	2,850	11	3,330
Tidal	House	1- 7-6	2	440	2	465
Tidal	Johnson	1- 7-6	1	30	1	25
Total Tidal			3	470	3	490
Twin State	Lowe	25- 8-6	1	130	1	125
Wigdon-Long	Jefferson	31- 7-7	1	35	1	40
TOTAL LITTLE RIVER			304	99,792	301	103,954

MAUD

Amerada	Gossland	8- 8-5	1	660	1	0
Amerada	Hallum	1- 8-4	1	3,665	1	3,665
Barnsdall	Fife	14- 8-5	1	1,365	1	1,425
Gypsy	Bourassa	7- 8-5	1	0	1	0
I. T. I. O.	Simpson	10- 8-5	1	54	1	48
I. T. I. O.	State	16- 8-5	1	0	1	0
Prairie	Campbell	18- 8-5	1	142	1	125
Pure	Lindley	18- 8-5	1	0	1	0
TOTAL MAUD			8	5,886	8	5,263

MISSION

Carter	Fuswa	18- 8-6	1	0	1	0
Carter	Micco	8- 8-6	1	0	1	0
Gypsy	Baby	6- 8-6	1	15	1	15
Gypsy	Barkus	6- 8-6	1	0	1	0
Gypsy	Dosar	7- 8-5	1	1,037	1	1,195
Gypsy	Mission	5- 8-6	1	0	1	0
Gypsy	Mosar	1- 8-5	1	0	1	0
Marland	Maines	7- 8-6	1	92	1	115
Mid-Kansas	Moore	7- 8-6	1	85	1	102
Roxana	Maines	7- 8-6	1	0	1	0
Rox-Marland	Hernsdon	7- 8-6	1	0	1	0
Slick	Tiger	13- 8-5	1	0	1	0
Twin State	Hayes	8- 8-6	1	50	1	50
TOTAL MISSION			12	1,249	12	1,477

SUMMARY

TOTAL LITTLE RIVER	**304**	**99,782**	**303**	**103,954**
TOTAL MAUD	**8**	**5,886**	**8**	**5,263**
TOTAL BOWLEGS	**312**	**47,958**	**312**	**48,859**
TOTAL EARLSBORO	**288**	**75,300**	**287**	**75,733**
TOTAL SEMINOLE	**286**	**40,965**	**286**	**41,857**
TOTAL SEARIGHT	**67**	**10,133**	**67**	**9,968**
GRAND TOTAL	**1,277**	**281,273**	**1,273**	**287 100**
Average per well			**220**	**226**

Completions in California, Week Ended November 24, 1928

Long Beach

Company	Well No.	Location	Depth	Init. Prod.
Shell	Dobyns 7	...	7514	140
Shell	Hutton 9	...	7500	2100
Shell	Marcellus 6	...	7015	926
Shell	Martin 6	...	7476	825
Shell	Shell Fee 4	...	7988 -	233
Seaple, Joseph	Maltby 6	...	6610	3800
Signal Syndicate	No. 8	...	6730	375
The Petroleum Co.	Beck 3	...	6094	1660
The Texas Co.	Foster 1-4	....	6340	2346

Santa Fe Springs

Universal Cons.	Blanchard 6	....	5760	2600
Wilshire Oil	Cecelia 1B	.....	5800	3930

Seal Beach

Marland	Bixby 24	...	4823	962
Geo. F. Getty	Fee No. 2	....	6885	120

Athens Rosecrans

Barnsdall	O'Dea 13	...	5404	2100

Bellridge

Berry Oil	No. 231	30-28-21	676	60

Drilling Operations in Oklahoma, Kansas and Texas, Week Ended December 1, 1928

	Dec. 1 Loc.	Rigs	Drg.	S.D.	Week Ended Total	Nov. 24 Loc.	Rigs	Drg.	S.D.	Total
OKLAHOMA										
Osage	4	5	35	2	46	.	6	39	1	46
Bristow-Cushing	7	7	38	4	56	5	10	38	5	58
N. Oklahoma	6	4	48	30	88	8	5	44	31	88
S. Oklahoma	9	8	86	33	136	13	20	76	26	135
Muskogee	..	7	39	28	74	.	7	44	26	77
Okmulgee-Bristow	8	39	53	27	127	7	32	62	28	129
Seminole Dist.	25	98	336	25	484	25	130	303	22	480
Total Oklahoma	59	168	635	149	1,011	58	210	605	139	1,013
KANSAS	..	*50	237	53	340	.	*42	233	56	331
TEXAS										
Central	64	24	205	139	432	54	28	195	145	422
Panhandle	20	19	88	55	182	19	21	92	47	179
N. Central	29	33	131	39	232	20	27	137	38	222
West	34	7	118	79	238	96	51	214	130	491
Total Texas	147	83	542	312	1,084	189	127	638	360	1,314
New Mexico	9	2	33	13	57	4	3	32	15	54
GRAND TOTAL	215	303	1,447	527	2,492	251	382	1,509	570	2,712

*Location and Rigs combined.

Completions in Oklahoma and Kansas, Week Ended December 1, 1928

OKLAHOMA

Beckham County

Company	Well No.	Location	Depth	Init. Prod.
Magnolia	1	C SW SE 21-9-23 W	T.D. 2750	21M

Caddo County

Company	Well No.	Location	Depth	Init. Prod.
Magnolia	3	NEc NW SW 5-5-9 W	2408-2418	10

Carter County

Company	Well No.	Location	Depth	Init. Prod.
Roxana	3	SE SW NW 11-2-3 W	2817-3531	96

Comanche County

Company	Well No.	Location	Depth	Init. Prod.
Magnolia	2	SE SW NE 30-2-9 W	2138-2150	7

Cotton County

Company	Well No.	Location	Depth	Init. Prod.
Crane	1	C NW NE 33-2-9 W	T.D 3505	Dry

Creek County

Company	Well No.	Location	Depth	Init. Prod.
Sinclair	1	NWc SW SE 27-14-10 E	T.D. 3623	Dry
Sapulpa Fuel	1	C SE NE 6-17-11 E	T.D. 2357	Dry
Ice et al	1	NWc SE SW 28-18-11 E	T.D. 2356	Dry
Dixie Drlg	2	C SE NW 28-18-11 E	T.D. 2492	OWD Dry
Wallace	1	CWL NW NW 2-17-11 E	1970-1982	2M
Houston	2	NWc SE NE 20-17-7 E	2783-2810	240
Shaffer	18	NEc SW NW 17-17-7 E	2702-2733	125
Lebow	16	SWc NE NW 17-17-7 E	2726-2744	165

Grady County

Company	Well No.	Location	Depth	Init. Prod.
Okla. Gas Utilities	14	SW NW SW 26-5-8 W	2002-2350	17M

Grant County

Company	Well No.	Location	Depth	Init. Prod.
Argo	2	SEc 15-27-3 W	2969-2995	25

Jefferson County

Company	Well No.	Location	Depth	Init. Prod.
Dye-Fritz	1	C SE SE 5-6-7 W	T.D. 2270	Dry

Lincoln County

Company	Well No.	Location	Depth	Init. Prod.
Texas Pacific	3	SW NE SE 31-17-5 E	4181-4214	12

Muskogee County

Company	Well No.	Location	Depth	Init. Prod.
Wasaff	3	NEc SW SE SW 32-14-18 E	T.D. 1515	Dry
Tidal	1	CNL NW NE NE 3-14-18 E	T.D. 1202	Dry
Bradley	1	NEc SE NW 21-15-19 E	T.D. 1079	Dry

Okfuskee County

Company	Well No.	Location	Depth	Init. Prod.
Misener	1	NWc NE 21-10-11 E	T.D. 1712	Dry
Atlantic	2	CWL NW SW 12-10-11 E	1650-2027	75
Umburn	5	CSL N½ NE SE 11-10-11 E	2009-2038	75
Champlin	11	SWc SE SE 15-11-11 E	3458-3485	300

Okmulgee County

Company	Well No.	Location	Depth	Init. Prod.
Kirkland-Son	3	SEc NW 19-15-13 E	1550-1630	12
Wheeler et al	1	SWc NE NE 35-15-12 E	2194-2270	5M
Unger Bros	2	CNL NW NE 25-13-14 E	T.D. 2310	Dry
Devonian	1	NEc NW NW 19-15-14 E	T.D. 2471	Dry
Kirkland-Son	1	C SW NE 19-15-13 E	T.D. 2216	Dry
Moffitt et al	7	CSL SW SE 6-11-12 E	T.D. 2350	OWD Dry
Brock et al	1	SEc NW 25-13-12 E	T.D. 3052	Dry
Newman-Atlantic	1	SEc NW 8-13-11 E	T.D. 3228	Dry
Hazlett et al	1	CNL SW SW 27-16-12 E	T.D. 2600	Dry

Osage County

Company	Well No.	Location	Depth	Init. Prod.
Peters	1	NWc SE SE 8-21-9 E	T.D. 435	Dry
Bement	6	NEc SW SE 10-25-8 E	T.D. 1014	Dry
Moore	17	SWc SE SW SW 9-21-9 E	T.D. 299	20

Pawnee County

Company	Well No.	Location	Depth	Init. Prod.
Thompson-Black	2	NWc SW SW 14-20-9 E	927-960	1.5M
Mowrey et al	1	SWc NW 15-21-7 E	T.D. 2911	Dry

Payne County

Company	Well No.	Location	Depth	Init. Prod.
Producer & Ref	1	NWc SE SW 7-18-5 E	2802-2823	50

Pontotoc County

Company	Well No.	Location	Depth	Init. Prod.
La Salle	1	SEc 30-5-5 E	2460-2638	75
Texas	4	NWc NE 19-5-8 E	2580-2650	1262
Texas-Pacific	3	SEc 19-5-8 E	T.D. 1420	Dry

Pottawatomie County

Company	Well No.	Location	Depth	Init. Prod.
Gypsy	2	SWc SE 5-9-5 E	4518-4530	990
Mid-Continent	1	SEc SW 5-9-5 E	4589-4597	1190
Magnolia	2	NE SE NW 36-7-3 E	3940-3975	30
Shaffer	2	NWc SW 19-7-4 E	T.D. 4357	OWD Dry
Healdton	1	SW NW NW 20-7-4 E	4213-4259	123
Indep.-Darby	3	SW NE NE 23-7-4 E	4512-4532	35
Magnolia	1	NE SE NE 26-7-4 E	4272-4285	5577
Magnolia	3	SW NE SW 19-7-5 E	4220-4240	291
Pure	1	SWc NW 19-7-5 E	3769-3869	220
Slick	4	NW SE SW 19-7-5 E	4275-4286	960
Magnolia	2	NW NE NW 29-7-5 E	4375-4395	66
Sinclair	3	NW SW NW 29-7-5 E	4097-4245	220
Sinclair	5	NWc SW 29-7-5 E	4244-4299	285
Gypsy	4	SW NE NE 30-7-5 E	4405-4432	840
Independent	3	NW NE SW 30-7-5 E	4115-4225	457
Independent	4	NE NW SW 30-7-5 E	4385-4399	25
Independent	5	SE NE SW 30-7-5 E	4220-4254	825
Independent	6	SW NW SW 30-7-5 E	4220-4251	32
Phillips	1	NWc NE 30-7-5 E	4250-4275	135
Phillips	4	SE NW NE 30-7-5 E	4210-4238	512
Shaffer	1	NE SE SW 30-7-5 E	3782-3820	1627
Slick	1	NEc NW 30-7-5 E	4050-4259	740
Slick	3	SW NE NW 30-7-5 E	4090-4240	202
Slick	1	NWc SE 30-7-5 E	4162-4344	95

Seminole County

Company	Well No.	Location	Depth	Init. Prod.
Gypsy	14	SW NE SE 1-9-5 E	4448-4463	40
Carter	3	NE NW NW 24-7-6 E	4413-4418	735
Pure	1	SW NW SW 24-7-6 E	4387-4394	1405
Twin State	4	NEc SE 11-8-6 E	T.D. 3856	Dry
Carter	2	SW SE SW 11-7-6 E	T.D. 4521	Dry

Stephens County

Company	Well No.	Location	Depth	Init. Prod.
Atlantic	1	SWc NW 12-1-4 W	3079-3604	268

Tulsa County

Company	Well No.	Location	Depth	Init. Prod.
Anthony	3	NWc NE SW 3-16-12 E	1917-1927	2M

Wagoner County

Company	Well No.	Location	Depth	Init. Prod.
Duke et al	1	NEc SW NW 36-16-17 E	832-850	3.5M

KANSAS

Butler County

Company	Well No.	Location	Depth	Init. Prod.
Garden et al	2	CSL NE NW 6-27-6 E	2724-2745	20

Elk County

Company	Well No.	Location	Depth	Init. Prod.
Derby-Frazier	1	NE NW SW 10-31-10 E	1970-2009	100
Sherman et al	2	SWc NW 10-31-10 E	1980-2018	125
Wakefield et al	1	SW SE NW 10-31-10 E	1978-2012	15

Franklin County

Company	Well No.	Location	Depth	Init. Prod.
Haworth-Howard	1	C NW SE 25-16-17 E	1232-1235	1.2 M
Haworth-Howard	1	C SE SE 25-16-17 E	T.D. 1200	Dry

Greenwood County

Company	Well No.	Location	Depth	Init. Prod.
Simmons-Amerada	6	SWc SE 26-23-11 E	T.D. 2010	Dry
Empire	9	NW SW NE 21-23-11 E	1883-1933	100
Phillips	1	NEc NW 35-23-11 E	1835-1861	175
Skelly et al	3	C S½ NE 4-23-13 E	1707-1727	10
Mohawk	3	NW SE NW 7-27-11 E	1882-1889	50

New Field Operations in Oklahoma, Kansas, Panhandle, North, North Central and West Texas, Week Ended December 1, 1928

OKLAHOMA

Beckham County

Company	Well No. Farm	Location
Co-Opera. Synd	1-Joyce	NEc 22-9-23 W
Magnolia	2-Gray	C SE SW 14-9-23 W

Cleveland County

Company	Well No. Farm	Location
Slick-Phillips	1-Sudik	C NE NE 8-10-2 W

Coal County

Company	Well No. Farm	Location
Hepburn	1-Richardson	C NE NE 6-2-8 E

Creek County

Company	Well No. Farm	Location
Curtis	1-Adams	NWc 15-18-9 E
Roach et al	3-Beavers	SEc NW NW 35-18-9 E
Ogg Pet	1-Smith	SEc NW SW 35-16-9 E
Wilcox-Oswalt et al.	8-Anthis	CSL NW SW 1-16-11 E
Havel et al	1-Ramsey	NEc SE 10-14-10 E OWD
Hall-Donnelly	1-Johnson	NE SE NW 17-14-10 E OWD
Twin State	6-Coachman	NW SW NE 20-17-7 E
Twin State	5-Coachman	SW NW NE 20-17-7 E
Markham	7-Beesley	NE SE NW 20-17-7 E
Houston	3-Bullett	SW NE NE 20-17-7 E

Kay County

Company	Well No. Farm	Location
Leonard et al	3-Binney	C NW SW 21-27-1 E

Kiowa County

Company	Well No. Farm	Location
Bridwell et al	1-Foster	SEc NW 18-6-16 W

Muskogee County

Company	Well No. Farm	Location
P & R Drlg	1-Ragan	NEc 19-13-16 E
Bryan-Emery	5-Barnett	CWL SE NE 8-15-15 E OWD

Okfuskee County

Company	Well No. Farm	Location
Atlantic	1-Micco	NWc SW SW 12-10-11 E
Devonian	5-Fier	C SW NE 11-10-11 E
Atlantic	1-Field	NWc 13-10-11 E
Minnehoma	1-Fixico	NW SW SE 29-12-10 E

Okmulgee County

Company	Well No. Farm	Location
Hazlett	6-Tucker	SEc NW SE 2-13-14 E OWD
Pine	1-Doyle	NEc SE NW 18-15-13 E
Sidwell Drlg	3-Lunsford	NEc SW SW 4-14-11 E
Winemiller	1-Warren	SWc NE 13-14-11 E

Osage County

Company	Well No. Farm	Location
Tidal	1	NEc NW SW 29-21-11 E
Silurian	53	SE SW NE 17-23-12 E
Silurian	5	SE NW SE 12-23-11 E
Barbour	1	NWc NE NE 32-23-9 E

Pawnee County

Company	Well No. Farm	Location
Hemlock	1-Williams	NEc 8-20-9 E
Operators	1-Powell	SEc NE NW 15-20-9 E

Pontotoc County

Company	Well No. Farm	Location
Ogg Pet. et al	1-Bolen	SWc 29-5-5 E
Ogg Pet	3-Roberts	SW SE SW 29-5-5 E

Pottawatomie County

Company	Well No. Farm	Location
Atlantic	1-Perry	NE SE NE 13-9-4 E
Amerada	1-Ballard	SE SW SE 1-8-4 E
Amerada	2-Hallum	SEc 1-8-4 E
Amerada	3-Hallum	SW SE SE 1-8-4 E
Gypsy	1-Hartman	NE NW NE 12-8-4 E
Tidal	1-Dunn	NEc 12-8-4 E
Tidal	2-Dunn	NW NE NE 12-8-4 E
Pure	1-Beebee	SEc SW 6-8-5 E
Amerada	1-Fehlig	SWc NE 7-8-5 E
Amerada	2-Fehlig	SE SW NE 7-8-5 E
Amerada	3-Fehlig	NWc NE 7-8-5 E
Amerada-Marland	1-Calvin	NWc 7-8-5 E
Gypsy	3-Bourassa	SW SE NE 7-8-5 E
Gypsy	4-Bourassa	SE NE NE 7-8-5 E
Gypsy	5-Bourassa	NE SE NE 7-8-5 E
Pure	2-Wiley	NEc NW 7-8-5 E
Texas	2-Calvin	NWc SE 7-8-5 E
Texas	3-Calvin	NW NE SE 7-8-5 E
Amerada	2-Gossland	SE NE SW 8-8-5 E
Amerada	3-Gossland	NE SE SW 8-8-5 E
Pure	4-Wiley	NW SW NW 8-8-5 E
Shell	1-Wiley	SW NW NW 8-8-5 E
Shell	2-Wiley	NWc 8-8-5 E
Tidal	1-Smith	NW SW SE 8-8-5 E
Wilcox	2-Wilson	SW NW SE 8-8-5 E
Laurel	1-Billington	SE NE NW 18-8-5 E
Continental	1-Neghnguit	SEc NW 19-7-4 E OWD
Sinclair	12-Blandin	SE SW SW 24-7-4 E
Gypsy	3-Bruno	SW NE NW 25-7-4 E
Shell	1-Livingston	SWc SE 23-7-5 E

(*Continued on Page 47*)

New Field Operations in Oklahoma, Kansas, Panhandle, North, North Central and West Texas, Week Ended December 1, 1928

(Continued from Page 46)

Seminole County

Company	Well No. Farm	Location
Skelly	4-Sheperd	NE SW NW 6-9-6 E
Skelly-Atlantic	2-Lottie	SE NW NW 6-9-6 E
Magnolia	2-Killing	SW NW NW 14-8-5 E
Sinclair	1-Jefferson	SE NE SE 23-5-7 E

Stephens County

Magnolia	5-Worrell	NWc NE NW 19-1-8 W
Mudge	1-Grace	C SW 15-1-5 W
Pace et al	1-Bush	NEc NW 3-2-8 W OWD

KANSAS

Butler County

Empire	6-Willets	SEc SW 22-27-5 E
Phillips	1-Green	NW SW NW 23-27-5 E
Empire	5-Hutchinson	NWc NE 27-27-5 E
Empire	7-Willets	NEc NW 27-27-5 E

Edwards County

British American	1-McCarthy	NEc NW 31-25-17 W

Greenwood County

Phillips	3-Green	NWc NE 11-22-10 E
Empire	15-Schwab	SE SW NE 25-22-12 E
Derby	1-Walter	NE NW NW 21-22-13 E
Amerada	5-Luthi	SE NW SW 29-22-13 E
Empire	10-Edwards	SE SW NE 21-23-11 E
York State	1-Rice	SW SE NE 21-23-11 E
Empire	1-Hillman	NW SE NE 35-23-11 E
Marshall et al	8-Bonnett	SWc NW 13-24-12 E

Marion County

Frank et al	1-Schlotthauer	NE SE NW 25-19-3 E

Rice County

Higgins et al	1-Scharr	NEc SW 21-20-10 W

Russell County

Mid-West Expl	31-Austin	SWc 30-12-15 W
Mid West Expl	4-Booth	NE NW NE 29-11-15 W
Liggett et al	1-Stewart	SEc 17-11-15 W

Sedgwick County

Morgan et al	1-Fitzgerald	NWc NE 5-26-1 W

TEXAS
NORTH EAST CENTRAL TEXAS

Anderson County

Pure	2-Bruce	.....	Lewis

Brown County

Amerada	2-Wise	.....	Clark
Texas	5-Byler	Blk-43	T&NO
Humble	8-Byler	Blk-43	T&NO
Humble	7-Byler	Blk-43	T&NO
Lloyd	12-Collier	Blk-139	Smith
Adrey Bros	1-Gaines	Sec-43	HT&B
Stone-Gilbert et al	1-Tate	Blk-796	Lackman
Young Bros. et al	1-Butler	Blk-783	Benson
Bearman et al	3-Spencer	.....	Swindle
Cranfill-Reynolds	1-Hickman	Blk-783	Benson
Anderson et al	1-Wheeler	Blk-91	Lively
Armstrong et al	1-Armstrong	Blk-1	H&GN

Callahan County

Mee et al	1-Cowling	Sec-76	BOAL
Malone Bros	1-Berry	Sec-70	BOAL

Coleman County

Texas	3-Hays	Blk-93	Bond
Tower et al	3-Moody	Sec-10 Blk-665	Scott
Cont.-Atlantic	3-Overall	Blk-700	Barkley
Cunningham et al	5-Jennings	Blk-94	Lipscomb

Eastland County

Hoffman-Page	1-Coon	Sec-27 Blk-2	H&TC
Mays-Heath	1-McCard	.....	Lyman

Erath County

Snebold-White	1-Smith	.....	Bishop

Haskell County

Phillips	1-McKnight	Sec-158 Abst-103	Craig

Jack County

Elaton et al	1-Hoefle	.....	Davis

Jones County

Snowden-McSweeney	4-Bickley	Sec-50 Blk-18	T&P
Texas	3-Carter	Sec-13 Blk-19	T&P
Roberts	6-Grayson	Sec-13 Blk-19	T&P
Phillips	5-Mason	Sec-18 Blk-19	T&P
Phillips	1-Winters	Sec-19 Blk-19	T&P
Phillips	2-Pomroy	Sec-16 Blk-19	T&P

Palo Pinto County

Chestnut-Smith	1-Bedding	Sec-3 Abst-19	WB&M
Texas-Pacific	1-Roberson	Sec-56 Blk-3	T&P

Runnels County

Vacuum	1-Brevard	Sec-21 Blk-532	Diaz
Boyce et al	1-Langs	Blk-262	Austin et al.

Shackelford County

Company	Well No. Farm	Location	Survey
Roeser-Pendleton	11A62-Cook	Sec-62	ET
Roeser-Pendleton	10A62-Cook	Sec-62	ET
Roeser-Pendleton	28A61-Cook	Sec-61	ET
Roeser-Pendleton	27A61-Cook	Sec-61	ET
Roeser-Pendleton	26A61-Cook	Sec-61	ET
Roeser-Pendleton	25A61-Cook	Sec-61	ET
Roeser-Pendleton	24A61-Cook	Sec-61	ET
Roeser-Pendleton	83A61-Cook	Sec-60	ET
Collett	1-Taylor	Sec-6 Blk-11	T&P
Humble	1-Flippen	Sec-34 Blk-11	T&P
Cranfill-Reynolds	2-Flippen	Sec-34 Blk-11	T&P
James	1-Eahart	Sec-18 Blk-11	T&P

Stephens County

Arab-Beatty	1-Ledbetter	Sec-84 Blk-6	T&P
Ramsey-Decker et al.	1-Keathley	Sec-24 Blk-5	T&P
Poee-Ward et al	1-Dixon	Sec-2075	TE&L

Throckmorton County

Proffitt et al	1-Walker	....	McCoy

NORTH TEXAS

Archer County

Consolidated	1-Wright	Sec-2435	TE&L
Gulf Prod	7-Hayter	Sec-2409	TE&L
Rogers-Kelleher	1-Marsh	Blk-130	Harris
Rathke-Panhandle	9-Prideaux	.....	Rohus
Shasta	1-Meade	Blk-35	Meade
Freeman-Grebin	2-Hennig	Blk-21	Meade
Texas	1-Montgomery	Blk-133	Harris
Gulf Prod	1-Wilson	Sec-114 Blk-3	ATNCL
Texas	1-Wilson	Sec-12 Blk-3	H&TC
Petroleum Prod	1-Parish et al.	.....	Hooper et al.
Humble	1-Wilson	Sec-114 Blk-1	ATNCL
Hunter	1-Krebs	Abst-325	Naila

Cook County

Camp	1-Belz	Abst-334	Davis
North Texas	1-Dill	Abst-69	Bond

Clay County

Phillips	1-Myers	Abst-1014	Skerett

Fannin County

Scrivenor-Honea	1-Griffith	Abst-1147	Windle

Wichita County

Holbrook-Woods	25-Kemp	Blk-82	KWVFL
Cotton	1-Michie	.....	Netherly

Wilbarger County

Waggoner	6-Waggoner	Sec-33 Blk-4	H&TC
Golding-Cochran	2-Waggoner	Sec-32 Blk-4	H&TC
Simms	9-Waggoner	Sec-5 Blk-5	H&TC
Texas	1-Waggoner	Sec-21 Blk-4	H&TC

Young County

Riggs et al	6-Sweet	Sec-1488	TE&L
Riggs et al	22-McKinley	Sec-1489	TE&L
Mook-Texas	11-Davis	Sec-1487	TE&L
Underwood-Cont.	3-Campbell	Sec-1390	TE&L
Moran Drlg	3-Graham	Sec-193	TE&L
Gulf Prod	1-Bullock	Sec-61	TE&L
Cooper-Britton	1-Parish	Sec-409	TE&L

PANHANDLE

Gray County

Wilcox	31-Worley et al.	Sec-63 Blk-3	I&GN
Texas	5-Davis	Sec-86 Blk-3	I&GN
Phillips	4-Johns	Sec-87 Blk-3	I&GN
Gulf Prod	4-Holmes	Sec-87 Blk-3	I&GN

Hutchinson County

Timms et al	1-Moore	Sec-21 Blk-M-21	TC

Moore County

Canadian River	1-Killgore	Sec-18 Blk-PMc	EL

Wheeler County

Wishkamper	1-Parsons	Sec-53 Blk-23	H&GN

WEST TEXAS

Howard County

California	2-Roberts	Sec-137 Blk-29	W&NW
Glasscock et al	1-Overton	Sec-5 Blk-32	T&P
Sun	5-Settles	Sec-135 Blk-29	W&NW

Pecos County

California	1-Smith	Sec-16 Blk-194	GC&SF
California	2-Yates	Sec-34 Blk-194	CG&SF
Gulf Prod	16-Yates	..... Runnels County	Sch. Ld.

Upton County

Texas Pacific	12-Lane	Sec-5	GC&SF

Winkler County

Atlantic	7-Hendricks	Sec-41 Blk-B-5	PSL
Atlantic	7-Hendricks	Sec-46 Blk-26	PSL
Leet-Edwards	1-Hendricks	Sec-5 Blk-B-12	PSL
Marland	2-Morton	Sec-27 Blk-B-12	PSL
Pure	13-Hendricks	Sec-45 Blk-26	PSL
Pure	14-Hendricks	Sec-45 Blk-26	PSL
Republic Prod	12-Hendricks	Sec-45 Blk-26	PSL
Southern Crude	T88L3-Hendricks	Sec-4 Blk-B-12	PSL
Southern Crude	T88L4-Hendricks	Sec-4 Blk-B-12	PSL
Southern Crude	T88D3-Hendricks	Sec-4 Blk-B-12	PSL
Southern Crude	T88D4-Hendricks	Sec-4 Blk-B-12	PSL

Completions in Texas, Week Ended December 1, 1928

NORTH EAST CENTRAL TEXAS

Brown County

Company	Well Farm	Survey Sec. and Blk.	Depth	Init. Prod.
Stephens	1-Kirkpatrick	Hawkenburg Sec-8 Blk-105	T.D. 1140	Dry
Riordan et al	1-Pugh	Jennings Blk-353	T.D. 1507	Dry
Lockhart	1-Gordon	Marshall Blk-605	T.D. 1980	Dry
Hammon et al	6-Curry	Kenney Blk-624	T.D. 1086	Dry
Cunningham-Texas	1-Brooks	Holstein Blk-115	T.D. 1351	Dry
Clark Buffalo	2-Keesee	Lewis Blk-42	T.D. 1806	Dry
Amerada	1-Edwards	Clark	T.D. 658	Dry
Midwest Exp.	4-George	Cross	1324-1328	12
Humble	6-Allen	Delgando Sec-7 Blk-789	1142-1145	9
Gilman-McMurray	20-Texon	Smith Blk-155	1190-1194	25

Callahan County

Hays	2-Hearn	BBB&C Sec-129	725-739	20
Texas	8-Hatchett	D&DA Sec-29	337-353	6
Texas	7-Hatchett	D&DA Sec-29	342-358	25
Stratton	1-McDaniel	Comal Co. Sch. Ld. 71	340-342	5
Reiter-Foster	4-Hatchett	D&DA Sec-24	339-347	60
Moutray	4-Hatchett	D&DA Sec-29	T.D. 373	Dry

Coleman County

Taylor Link	1-Stewardson	ET Sec-91	T.D. 2570	Dry
Spear et al	1-Jones	Comal Co. Sch. Ld. Sec-31	T.D. 486	Dry
Price	1-Le Fores	GH&H Sec-70 Blk-1	T.D. 2395	Dry
Logan-Carter	1-Burke	Williams Blk-655	T.D. 1391	Dry
Forrester et al	4-Davenport	Dunlavy Blk-259	T.D. 950	Dry
Dunigan et al	3-Rice	Bond et al Blk-91	T.D. 1170	Dry
Corsicana	1-Robertson	Fotan Blk-224	T.D. 150	Dry
Tower-McKenna	2-Moody	Scott Sec-10 Blk-665	1854-1860	312
Texas	2-Hays	Bond et al Blk-93	1151-1152	25

Eastland County

Texas-Pacific	3-Fee	Delano	T.D. 858	Dry
Clark et al	1-Ferguson	ET Sec-10 Blk-2	T.D. 1710	Dry
Stalker	1-Holcomb	House	1590-1592	4M
Root et al	2-Watson	H&TC Sec-37 Blk-4	3950-3990	25
Root et al	1-Ammerman	H&TC Sec-46 Blk-4	3205-3227	½M
Fort Ring	1-Jones	Howell Blk-5	3094-3096	8M
Fort Ring	1-Calvert	McLennon Co. Sch. Ld. Blk-9	3093-3125	5½M
Dale	12-Fox	McLennon Co. Sch. Ld. Sec-58	1611-1613	18
Arkansas Fuel	12-Connellee	Ussery	1250-2154	10

Jack County

Seaboard	5-Cullers	Cullers Sec-4 Abst-2188	1973-1984	20
O'Neal	1-Powell	Rowll	T.D. 606	Dry

Jones County

Eastland et al	1-Derrick	T&P Sec-57 Blk-18	T.D. 2987	Dry
Phillips	6-Tessie	T&P Sec-19 Blk-19	2500-2509	200
Texas	2-Carter	T&P Sec-13 Blk-19	2501-2520	112
Sinclair	1-Bickley	..... Sec-50 Blk-18	2472-2477	300
McMann	1-Bickley	T&P Sec-50 Blk-18	3449-3468	310
Roeser-Pendleton	1-Grayson	Grayson	2555-2563	135
Roberts et al	2-Smith	T&P Sec-51 Blk-18	2491-2499	845
Roeser-Pendleton	1-Higgs	Scott Sec-30	1819-1820	30

Milam County

White et al	1-White	Taylor	1364-1367	½M

Navarro County

Chapman	1-Martin	Rahm	T.D. 3132	Dry

Palo Pinto County

Shaw et al	1-Gilbert	Williams Abst-886	T.D. 4150	Dry
Conway Bros.	1-Brothers	T&P Sec-62 Blk-3	3490-3950	¾M

Shackelford County

Cranfill-Reynolds	1-Flippen	T&P Sec-34 Blk-11	905-916	26
Roeser-Pendleton	81A60-Cook	ET Sec-60	1164-1185	25
Roeser-Pendleton	9A62-Cook	ET Sec-62	1355-1367	10&1M
Roeser-Pendleton	23A61-Cook	ET Sec-61	1271-1289	75
Roeser-Pendleton	21A61-Cook	ET Sec-61	1331-1336	75
Roeser-Pendleton	19A61-Cook	ET Sec-61	1327-1344	50
Roeser-Pendleton	44C60-Cook	ET Sec-60	1138-1154	25

Stephens County

Brown	4-Riddle	T&P Sec-67 Blk-4	1830-1879	60
Root et al	1-Hitson	LAL Sec-6	3227-3248	270
Wentz	1-Elliott	T&P Sec-55 Blk-7	T.D. 4097	Dry
Texas Fidelity	1-Adams	T&P Sec-53 Blk-6	T.D. 2500	Dry
Hanlon et al	2-Todd	T&P Sec-12 Blk-6	T.D. 2315	Dry
Lawton et al	1-McCleskey	T&P Sec-65 Blk-6	T.D. 3760	Dry

Throckmorton County

Jones et al	1-Wilhelm	TE&L Sec-651	T.D. 752	Dry
Baker et al	1-Doroving	TE&L Sec-913	T.D. 715	Dry

NORTH TEXAS

Archer County

Texas	22-Richardson	SAR Blk-6	1349-1363	30
Texas	9-Hayter	TE&L Sec-2409	1416-1426	4
Gulf Prod.	6-Hayter	TE&L Sec-2409	1442-1444	21
Gilliland	8-Neimeyer	TE&L Sec-2415	1420-1430	100
Rose et al	1-Parkey	Dallas Co. Sch. Ld. Blk-39	T.D. 1602	Dry

Company	Well Farm	Survey Sec. and Blk.	Depth	Init. Prod.
Rathke-Panhandle	8-Prideaux	Rohus	T.D. 656	Dry
Mount-Simms	1-Crombie	Harris Blk-81	T.D. 1372	Dry
Minnick	1-Wilson	Scott Abst-859	T.D. 1322	Dry
Jones et al	2-Andrews	TE&L Sec-1803	T.D. 900	Dry
Hall	1-Andrews	TE&L Sec-1806	T.D. 1051	Dry
Continental	1-Parrish	SP Sec-2 Abst-1004	T.D. 1605	Dry

Cooke County

Humble	1-Pirchfork	Gibson Sec-171	T.D. 4752	Dry
Pure	2-Emby	Moss Abst-736	1113-1235	50
Therton et al	1-Poteet	Stephens Abst-1001	1257-1271	20

Montague County

Continental	3-Jones	Donohoe	773-784	24

Wichita County

Lomax-Texas	1-Chilson	DCSL League 4 Blk 6	T.D. 1970	Dry
Humble et al	2-Witcher	Specht Sec-7	T.D. 1955	Dry
Coleman-Cappock	1-Denny	Balch Abst-12	T.D. 1580	Dry
United Prod.	3-Hodges	H&TB	T.D. 1494	168

Wilbarger County

Dixie	1-Webb	Hayman	T.D. 3628	Dry

Young County

Union Oil of Nevada	1-Wilson	TE&L Sec-162	T.D. 1015	Dry
Smith et al	1-Grubbs	TE&L Sec-647	T.D. 602	Dry
Creath-Kell	1-Nall	TE&L Sec-1997	T.D 551	Dry
Riggs et al	5-Sweet	TE&L Sec-1488	T.D. 580	Dry
Riggs et al	3-McKinley	TE&L Sec-1489	T.D. 580	Dry
Mook Texas	10-Davis	TE&L Sec-1487	T.D. 630	Dry
Albright et al	1-Green	TE&L Sec-1496	T.D 946	Dry
Creath-Kell	1-Wright	TE&L Sec-1900	T.D. 830	Dry
Humble et al	1-Hill	TE&L Sec-195	T.D. 1152	Dry
Root et al	1-Shanafel	McComber Sec-12	T.D. 4102	Dry
Whatley et al	1-Thedford	Burnett Sec-110 Abst-1580	T.D. 4385	Dry
Wise-Jackson	2-Calvin	Rohus Abst-240	590-595	42
Riggs et al	21-McKinley	TE&L Sec-1489	490-516	25
Pennell et al	7-Johnson	Sergeant	505-520	2
Kleiner et al	8-Davis	TE&L Sec-1487	548-563	25
Allday et al	5-Johnson	Sergeant Blk-15	562-578	8
Paull-Landreth	2-Thompson	TE&L Sec-2692	2065-2085	100

PANHANDLE

Gray County

Texas	6-Saunders	ACH&TB Blk-1	2653-2655	284
Texas	3-Flint	H&GN Sec-1	2745-2756	464
Magnolia	3-Fee	I&GN Sec 11 Blk-3	2822-2910	77
Wilcox	29-Reynolds	I&GN Sec-61 Blk-3	3076-3130	300

Hutchinson County

Phillips	1-Sanford	H&TC Sec-77 Blk-46	2932-2941	100
Phillips	12-Gibson	H&TC Sec-63 Blk-46	3869-2915	150

WEST TEXAS

Crockett County

Young-Donnelly	2-Shannon	D&SE Sec-18 Blk-10	T.D. 1736	Dry

Howard County

Taylor-Link	1-Abrams	T&P Sec 3 Blk-32	2375-2389	580

Midland County

Sheldon et al	1-Francis	..... Sec-13 Blk-40	T.D. 4565	Dry

Pecos County

California	1-Smith	TC Lease-3 Sec-23 Blk-194	1536-1754	10 (1 Hr.)

Runnels County

Kennedy	1-Talley	McKean Blk-534	T.D. 3015	Dry

Winkler County

Atlantic	1-Hendricks	PSL Sec-41 Blk-B-5	T.D. 2200	Dry
Republic Prod.	9-Hendricks	PSL Sec-41 Blk-B-5	T.D. 2380	Dry
Atlantic	6-Hendricks	PSL Sec-46 Blk-26	2733-2742	3000
Atlantic	1-Hendricks	PSL Sec-30 Blk-B-5	2856-2914	80
Empire	1-Leck	PSL Sec-3 Blk-74	3141-4142	3500
Roxana-Texas	4-Cowden	PSL Sec-3 Blk-B-12	2885-1895	9000
Roxana-Texas	10-Hendricks	PSL Sec-29 Blk-B-5	3013-3019	800 (1 Hr.)
Roxana-Texas	4-Hendricks	PSL Sec-39 Blk-26	2778-2788	600 (1 Hr.)
Marland	2-Hendricks	PSL Sec-34 Blk-26	2675-2838	40 (1 Hr.)
Mining Engr. of Arizona	1-Hendricks	PSL Sec-10 Blk-B-12	2781-3004	126 (1 Hr.)
Pure	7-Hendricks	PSL Sec-45 Blk-26	2612-2648	13000
Southern Crude	T671E3-Hendricks	PSL Sec-42 Blk-B-5	2949-2950	30 (1 Hr.)
Southern Crude	T88D1-Hendricks	PSL Sec-4 Blk-B-12	2725-2930	1500 (1 Hr.)
Southern Crude	T88T5-Hendricks	PSL Sec-30 Blk-B-5	2820-2998	500
Southern Crude	T88M13-Hendricks	PSL Sec-33 Blk-26	2805-2819	200 (1 Hr.)
Southern Crude	T88R1-Hendricks	PSL S3c-27 Blk-26	2590-2640	50M
Southern Crude	T88T5-Hendricks	PSL Sec-34 Blk-26	2795-2800	150 (1 Hr.)
Republic Prod.	10-Hendricks	PSL Sec-41 Blk-B-5	2550-2552	5000
Richardson et al	1-Sealy	GMMB&A Sec-50 Blk-F	2815-2973	250 (1 Hr.)
Skelly	1-Hendricks	PSL Sec-39 Blk-26	2859-3240	10
Southern Crude	T671A3-Hendricks	PSL Sec-42 Blk-B-5	2955-2961	300
Southern Crude	T671B5-Hendricks	PSL Sec-34 Blk-26	2800-2920	20 (1Hr.)

Completions in North Louisiana and Arkansas, Week Ended November 29, 1928

Louisiana—Webster Parish—Sarepta

Company	Well	Location	Depth	Yield
Virgil Helm	Maxwell No. 1	7-22-9	2680	10M gas
Magnolia Pet. Co.	W. P. Bond No. 1	5-22-9	2619	7M gas
Ohio Oil Co.	Haynes No. 1	30-23-9	2709	salt water, abd.

Bossier Parish

Ark. Nat. Gas Corp.	Wilkinson No. 1	5-22-11	3068	salt water, abd.
Morgan Oil Co.	Smith No. 2	26-19-11	500	dry, aband.

Caddo Parish

Woodley Pet. Co.	Whitehurst No. 2	16-12	2475	6M gas

La Salle Parish—Urania

Randall et al	Urania No. 1	12-10-1E	700	dry, aband.

Morehouse Parish

Nat. Gas Prod. Co.	Fee No. 1	9-20-4E	2135	10M gas

Union Parish

H. C. McDonald	Union Sawmill No. 1	18-23-1E	2305	salt water, abd.
Moody & Seagraves	Dawkins No. 1	17-20-4E	2140	13M gas

East Texas—Red River County

Bert Longenheim	Atkinson No. 1	Lonson-Moore HRS	1065	dry, abd.

Harrison County

Company	Well	Location	Depth	Yield
McRitchie et al	Baldwin No. 1	E. M. Fuller HRS	2180	dry, abd.

Panola County

D. Thomason	Crenshaw No. 11	B. C. Jordan HRS	2660	25M gas.

Arkansas—Clark County

McKenzie Oil Co.	Eakin No. 1	9-11-19W	1700	junked, abd.

Lincoln County

Pine Prairie O. & G. Co.	Carter No. 1	33-10-6	2126	dry, abd.

Union County—Rainbow City

Lion O. & R. Co.	Rowland No. 2	15-17-14	2980	15 bbls.
Lion O. & R. Co.	Rowland No. 5	15-17-14	3207	70 bbls.
Ohio Oil Co.	Carroll No. 1	6-17-13	3005	salt water, abd.
Ohio Oil Co.	Crain No. 4	1-17-14	3174	salt water, abd.
Ohio Oil Co.	C. B. Nash No. 2 Acct. 1	6-17-13	3032	1050 bbls.
Root Refineries	Mullins No. 1	21-17-14	2828	10 bbls.

Cost-Accounting for Oil Production

Principles and Methods for Computing and Recording Depletion, Depreciation

Article Three

By Lester C. Uren

Professor of Petroleum Engineering, University of California, Berkeley, Calif.

IN THE first article of this series, it was shown that capital expenditures on assets that are productive of revenue over long periods of time, are properly charged against appropriate suspense accounts and their cost gradually written off by making periodic charges against the operating cost records in accordance with the rate at which their useful service value diminishes. The important wasting assets of an oil-producing company are first, its physical plant; second, its productive oil and gas land; and third, the wells drilled and other facilities apart from plant, provided in the course of property development.

Periodic charges against operating cost, representing amounts written off to keep pace with the diminishing service value of these assets, are termed "depreciation" or "depletion," depending upon the nature of the asset. Depreciation is a term commonly applied to reduction in service value of physical plant, while depletion is a comparable term applied to cost of land and assets created in the course of its development. Depreciation and depletion charges constitute important elements in the cost of producing petroleum and natural gas, and those in charge of the cost records must adopt appropriate and reasonably accurate methods for determining and systematic methods for recording them.

THE *first* article in this new series by Professor Uren, written exclusively for NATIONAL PETROLEUM NEWS, appeared in its Oct. 24 issue. It set forth the common type of cost records and described a convenient classification of the various cost records which should be maintained by an oil producing company.

The *second* article, appearing in Nov. 7 issue of NATIONAL PETROLEUM NEWS, outlined a system for recording and distributing primary labor and material charges, the basis of all cost records.

This present *third* article takes up the principles and methods appropriate for computing and recording depreciation and depletion charges on producing properties. It gives recognized depletion rates for oil field equipment and a table of the average useful life for such equipment.

The *fourth* article, to be published in an early issue, will describe methods of developing cost records for use in the service departments of producing companies.

Many authorities now believe that the capital investment of an oil-producing company in plant and property, should be kept intact and not permitted to pass from the company's control until the termination of the life of the enterprise and the company's corporate existence is brought to a close. This can be accomplished by periodically setting aside in reserve funds, amounts equivalent to the estimated decrease in service value of the plant, and decrease in oil and gas content of the property. At any time, the sums accumulated in the reserve funds, plus the residual value of the plant and property, will always equal the original capital investment. From time to time, as plant replacements become necessary, or as additional land is purchased and developed to take the place of depleted properties, the depreciation and depletion reserve funds may be drawn upon to defray the expenses so incurred.

Aside from their application in the determination of production costs, the depreciation and depletion records thus constitute a measure of the sums that must be periodically set aside in reserve funds to provide for amortiza-

PHYSICAL PLANT DEPRECIATION RECORD

Electrical Dehydrating Plant. *1921 to 19--*

Date:	1921	1925	
Estimated Life:	8-yrs.	10-yrs.	
Estimated Scrap Value:	5%	same	

Year	Original Capital Outlay	Additions and Betterments	Renewals	Less Scrap Value	Total Service Value	Annual Depreciation Provision	Balance still to be Depreciated
1921	22,596 40			1130 00	21,466 40	2,683 30	18,783 10
1922						2,683 30	16,099 80
1923		4,480 80		224 00	25,723 20	3,215 40	17,141 20
1924						3,215 40	13,925 80
1925						3,215 40	10,710 40
1926						2,572 32	8,138 08
1927			2784 75		28,507 95	2,850 80	8,072 03

Fig. 1—Typical form for "register of plant" record card

tion of the original capital investment. Such records are essential in determination of dividends earned, in displaying residual book values of assets in oil property sales and mergers, and in recent years, have also served a useful purpose in determining taxable net profits in preparing Government income-tax returns.

Depreciation of Oil Field Plant

Physical plant depreciates in service through the operation of a variety of different causes, to which well known technical names have been assigned.[2] Physical plant may depreciate as a result of "wear and tear" in operation, or it may deteriorate by "decrepitude" or natural decay resulting through oxidation or weathering or mere age, whether it is actually used or not. A certain loss in exchangeable value is also suffered through "obsolescence," resulting from the development of improved and more efficient types of equipment which often necessitates the replacement of old equipment with new before it is worn out. Physical plant may also be prematurely scrapped as a result of "inadequacy" or "supersession," resulting from enlargement in the scale of operations, whereby the original plant is no longer of sufficient capacity. Mere lapse of time may occasion loss in value of physical plant, as in cases where the cost of the plant is in part based on the value of patents having a limited life period. At any given time, a plant unit may have a lower exchangeable value than it otherwise might have, by reason of "deferred maintenance." Proper maintenance may partially offset wear and tear, but a plant unit is seldom maintained up to its maximum efficiency, and the extent to which maintenance charges are in arrears must be estimated at the time an appraisal of the plant is made. Any or all of these causes of depreciation may be simultaneously operative.

The extent to which these different causes of depreciation may enter into the computation of depreciation charges, depends upon the nature of the plant and the use it receives. Some types of physical plant deteriorate rapidly in early life, the rate of depreciation diminishing with age. In other cases, the reverse is true. Ordinarily, it will not be possible to accurately evaluate the extent to which the different causes of depreciation are operative in the case of a particular plant unit. Certain causes of depreciation, such as obsolescence and inadequacy, are intangible and difficult to estimate with any degree of certainty, and yet they are important elements in the depreciation of most classes of physical plant. It follows, that no method of computing depreciation charges can be strictly accurate and applicable with uniform accuracy in all cases.

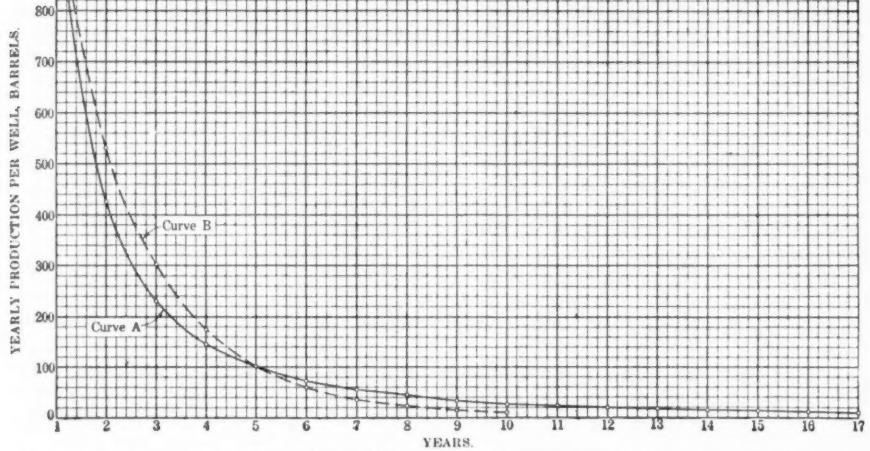


Fig. 2—Decline curves of two wells plotted on natural coordinates. (After W. W. Cutler in U. S. Bureau of Mines Bull. 228)

Lapse of Time the Proper Basis for Computing the Depreciation Charge

In some cases, wear and tear will be a controlling factor and the extent of use of the plant will largely determine the extent of depreciation. In other cases, where obsolescence, inadequacy, decrepitude and other factors control, the rate of deterioration will be measured by lapse of time and may bear little relation to the extent of use. A detailed study of oil-field plant and its rate of depreciation, leads to the conclusion that if a general basis is to be established for computing depreciation charges, it would accord more nearly with the actual deterioration of the average oil-field plant unit if the depreciation charges were computed on a basis of time elapsed rather than extent of use. Where radically different types of plant are involved and it appears that time is the controlling factor in some cases and extent of use in others, the depreciation charges might be computed on whatever basis seems most appropriate for each individual plant unit. Computing depreciation charges by two or more different methods, however, is confusing and leads to unwarranted complexity in the records. Most cost-accountants will prefer to adopt some one basis for computing the depreciation charges and to then use it for all cases. If this is done, it will generally be found that time is the most appropriate basis, and is on the whole, more nearly expressive of actual decrease in service value of the plant than any other.

Methods of Computing the Depreciation Charge

If we agree to adopt lapse of time as the proper basis for distributing the depreciation charges, there are several methods that might be made use of in computing them. Perhaps the best known method, and the one generally used in oil production cost-accounting practice, is the so-called "straight-line" method, in which the annual depreciation charge remains constant throughout the life of the plant, and the amount charged per year is determined by subtracting the estimated scrap value from the original cost value, dividing the difference by the estimated number of years of useful life. In another method, known as the "reducing balance of cost" or "percentage reduction" method, the residual useful service value is diminished annually by a fixed percentage of the residual value at the conclusion of the previous year. This results in a diminishing value for the depreciation charge, a condition that is difficult to justify on any basis. Two other methods of computing depreciation charges on a time basis are also used, which make use of interest. These are the "sinking fund" and "annuity" methods. The former method provides a constant annual charge that is somewhat less than that determined by the straight-line method, due to the fact that the depreciation fund is assumed to earn interest which accrues to the fund. The annuity method also provides a constant annual charge, sufficient not only to redeem the original cost of the plant within its useful life, but also to pay interest on the unredeemed balance of useful service value of the plant. Because of the interest feature, these two methods are considered inappropriate for use in computing depreciation charges by many cost-accountants.

The straight-line method probably accords with the circumstances surrounding oil-field plant as well, if not better, than either of the other methods, and because of its simplicity is generally to be preferred. In computing and recording the depreciation charges according to the

2. Leake, P. D., "Depreciation of Wasting Assets," (Book).

straight-line method, a separate record is maintained for each plant unit or group of similar plant units. This record displays the original cost value of the plant unit, its estimated useful life and the estimated scrap value that will survive after the useful life period has come to an end. The annual depreciation charge, determined by subtracting scrap value from original cost value and dividing by the estimated number of years of useful life, is subtracted, year by year, from the residual service value left at the conclusion of the previous year. The records should display at all times, the total of the amounts previously charged off and the amount to be charged off in future. Figure 1 illustrates a typical form for the "register of plant" as this record is customarily called. It is conveniently kept in card-catalog form. This record serves as the basis for journal and ledger entries to off-set plant depreciation, and indirectly enters into the make-up of cost records displaying the cost of conducting operations in different departments and in different phases of the work.

Estimating Useful Life Period of Oil-field Plant

In the procedure outlined above for computing the annual depreciation charge, the original cost value may, of course, be accurately determined from the equipment invoices and construction cost records. Residual scrap value of the plant may also be estimated within reasonable limits of accuracy. Scrap values are apt to be small in any case, and a considerable percentage error in estimating them would not greatly alter the final depreciation charge. The magnitude of the depreciation charge depends to an important degree however, on the useful life period assumed, and this is often a most uncertain quantity. It is of course, impossible to definitely predict the useful life of a particular plant unit. The best we can hope for in this connection, is an approximation of the useful life on the basis of average performance as determined from previous experience with the same character of plant under similar conditions.

The United States Government, in receiving income tax statements, permits oil-producing companies to make suitable reductions from gross income for depreciation suffered by physical plant, and as a basis for computing depreciation charges, the Internal Revenue Bureau recommends the depreciation rates specified in Table I herewith. In this table, the rates suggested are probably higher—that is, the average life period assumed is shorter—than is likely to be found true in most cases, but it is considered better policy to underestimate the life period rather than to overestimate it. Other similar studies of average life periods of oil-field plant have led to estimates differing somewhat from those recommended by the Internal Revenue Bureau. Table II gives average life periods for public utility and general manufacturing physical plant, as assembled from data gathered by a committee of the American Society of Civil Engineers.

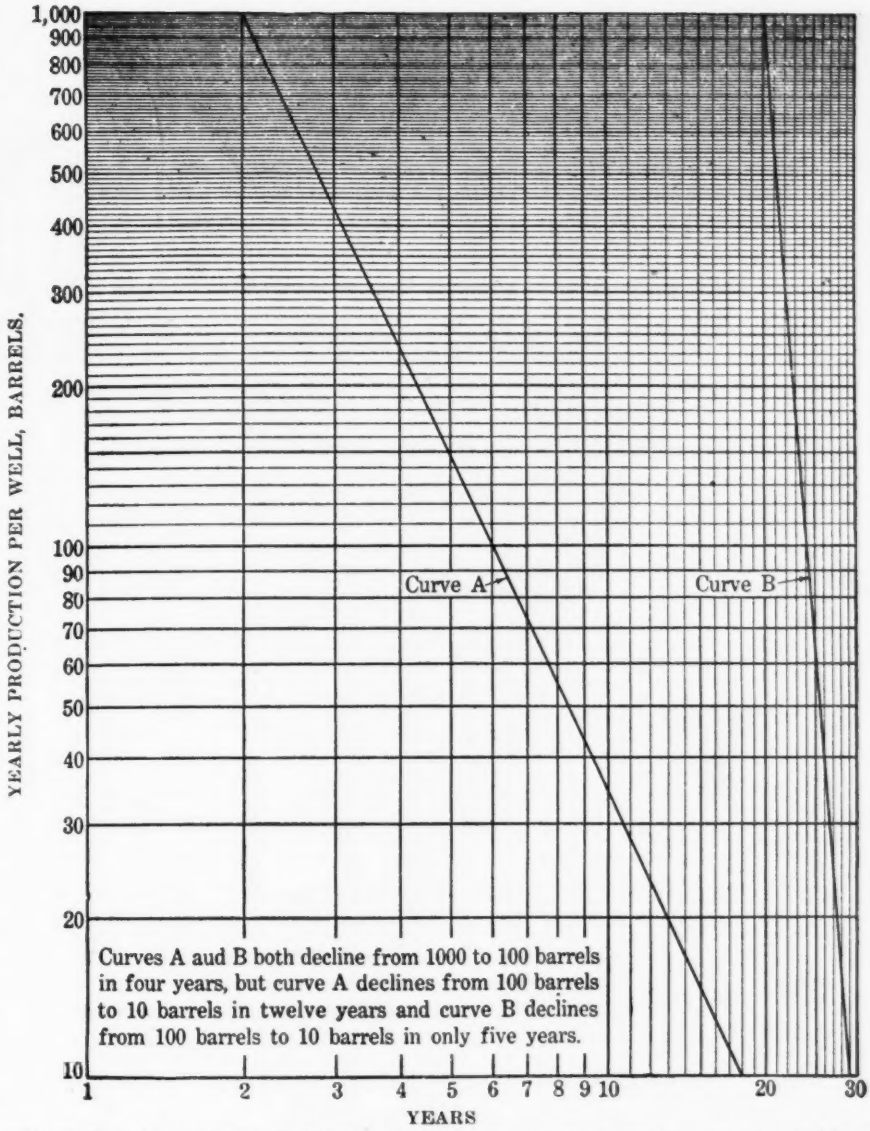


Fig. 3—Logarithmic graphs equivalent to those plotted on natural coordinates in Fig. 2 (After W. W. Cutler, in U. S. Bureau of Mines Bull. 228)

Depreciation of Plant Sometimes Written Off in Accordance With Rate of Depletion of Oil Land

Some cost-accountants prefer to write off the cost of plant at the same rate that is used in writing off property depletion. The records are somewhat simplified by so doing. Perhaps the only other justification for this practice is found in the fact that oil properties often have a shorter productive life than that which would otherwise be assumed for certain elements of the plant. Then too, it is argued that the profits are greater during the early period of flush production and that the greater part of the capital cost of the plant should be written off in this early period rather than burden the later years of productive life when profits are comparatively small.

Admittedly, the productive life of the property served by the plant is a limiting factor beyond which no estimates of useful life for individual plant units should extend, but depreciation of plant in accordance with property depletion is illogical and not consistent with what has been stated above relative to the nature of plant depreciation. When this plan is followed, the residual values shown on the records may be seriously in error when compared with the actual service value of the plant. Furthermore, the method fails to give proper expression to the rate of depreciation of certain plant units in which the useful life is materially less than the productive life of the property.

Cost of Plant Replacements, Improvements and Enlargements Should Be Added to Original Capital Investment in Plant

Additions to the plant which result in increased capacity or efficiency, obviously represent additional capital investment, and sums expended for this purpose should be added to the original sums debited

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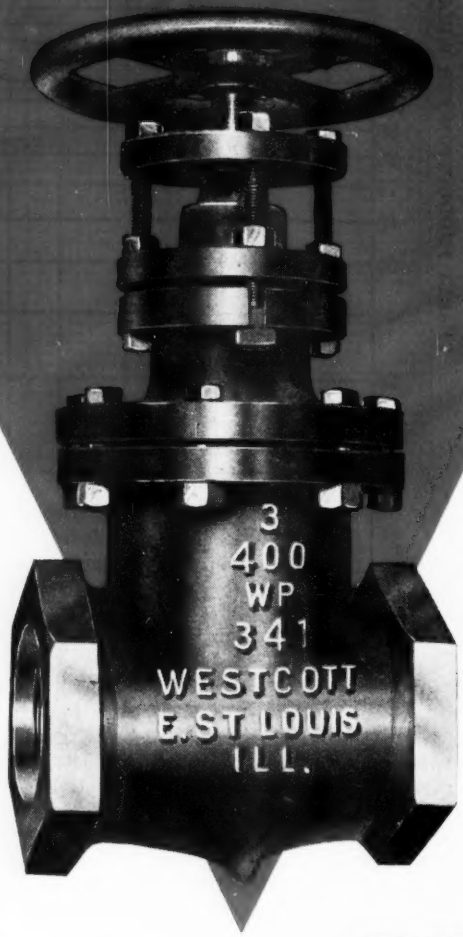

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against the plant accounts and the depreciation charges altered accordingly. In the case of plant replacements however, cost-accountants are not in agreement concerning whether or not the cost should be added to the original capital investment. It may be argued that the amount of capital at risk in the business is not increased by plant replacements and that the plant accounts should therefore be closed after the original plant is complete, except for additions which increase its earning capacity. On this theory, many cost-accountants charge the cost of such replacements into a maintenance account and the debit balances under the plant accounts are not increased. When this plan is followed, the amounts expended for plant replacements must be charged against the operating costs and the production cost of the particular period in which the replacement is made, is unduly inflated. A more logical plan would seem to be appropriate the cost of plant replacements from the depreciation reserve funds and charge the cost into the plant accounts in the same manner as plant improvements and enlargements, thus creating an additional sum to be written off in future as depreciation. The depreciation reserve funds will thereby be maintained and the computed production costs will at all times reflect the true cost of production.

Amortization of Oil Land and Development Cost

In considering the capital expense which must be redeemed through depletion charges, it is apparent that two classes of expenditures must be considered. The first of these is the original cost of securing title to the property, and second, that of drilling and equipping the wells for production. To the latter item we may also properly add the cost of building roads, excavating sumps and reservoirs and incidental other expense that attaches to the development of the property rather than to the physical plant. At times it may be difficult to distinguish between items of plant expense to be charged off through depreciation, and items to be charged against development expense and written off as depletion. The cost of well casing, rigs and derricks, rods, tubing and pumping equipment for example, may from one point of view, be regarded as physical plant, while from another stand-point the cost of such equipment may be regarded as attaching to the wells served, the cost of drilling which is charged against depletion.

A convenient means of discriminating between plant and development charges is to consider whether or not the equipment is permanently attached to the well which it serves, or whether it may under any circumstances, be removed and placed in service elsewhere. Practically all surface equipment, including engines, motors, rigs and rig equipment, under this interpretation, is properly charged against physical plant, to be written off as depreciation. This is also true of plunger pumps, rods and tubing and removable well equipment. Well casings, on the other hand, cement used in water exclusion, screen pipe, plugs and other fixed well equipment and material that may not ordinarily be removed from the wells, are charged against development expense and become a part of the cost of the wells, later to be charged off as depletion. It may be argued that even casing can be partially salvaged at the time of abandonment of the wells, but its residual value is practically negligible and the cost is often greater than the value of the material salvaged.

In considering the various items entering into the cost of acquiring title to oil land and subsequently developing and otherwise putting it into condition to produce, it is apparent that the cost of drilling and casing the wells will ordinarily constitute a large part of the aggregate sum to be written off as depletion. During the early life of a property, before it reaches full development, and perhaps before the limits of the productive territory are known, the number of wells to be drilled and the time at which they will be drilled, may be more or less uncertain; but if the development program is definitely planned at an early date, it should be possible to approximately forecast the total development expenditure that must be made on a per-acre basis.

Rate of Production the Proper Basis for Computing Depletion Charges

The depletion charges to be assessed against the cost of production, should be such as will reduce the unredeemed balance of property and development expense in proportion to reduction in quantity of the remaining producible oil and gas reserves. Each barrel of oil and each thousand cubic feet of gas must bear its proportional part of the total cost of the property and its development. It follows that the total of the depletion charges assessed against the different periods of operation will not remain constant, but will vary proportionally with the volumes of oil and gas produced during each period. During the early years of "flush production" when the rate of production is high, substantial sums will be written off as depletion, leaving comparatively small sums to be written off during subsequent periods when the rate of production is low.

It is apparent that in order to compute depletion charges on this basis, we must know or be able to approximately estimate the total cost of the property and its development, as well as the total quantity of oil and gas that it is likely to produce. The property and development cost can be estimated with some degree of accuracy after the conditions attending development are known and the development program to be followed has been definitely determined. The total volume of oil and gas to be produced during the productive life of the property however, cannot be accurately computed on any basis, and can only be approximately estimated after the property has been developed to a point where the productivity of different portions of it is disclosed and the rate of decline of the wells is established.

Methods of Computing Depletion Charges

Space does not here permit of explaining in detail the methods of estimating the future oil and gas productions of producing properties. It will perhaps be sufficient to state that estimates of future recoveries are customarily based on the average rate of decline of the individual wells or of a group of wells. By constructing production graphs for the various wells, in which the rate of production is plotted against time, a "decline curve" is developed which ordinarily so closely follows the trend established for it during the early period of productivity, that it may be projected on into the future and the productions likely to be realized during future periods approximately predicted. If plotted on natural coordinates, these graphs are usually hyperbolas (see Figure 2), and mathematical equations can be developed for them. Properly constructed on logarithmic coordinates, the same data yields a straight line which can be extrapolated to indicate future rates of production with fair accuracy. (See Figure 3). Perhaps the most convenient type of production graph for estimating ultimate recoveries, is the "rate-cumulative" production graph recently proposed by Marsh.[4] In this, the cumulative production is plotted against the rate of recovery and the result is a straight line. (See Figure 4). This straight line may be projected into the future to the minimum economic rate at which oil may be produced and the total recovery to be derived from the property up to that time is directly indicated. The relationships outlined in the various types of production graphs hold both for oil volume and gas volume.

Ordinarily a year or more must elapse before the ultimate production that may be secured from the property may be estimated by these methods with any degree of certainty, and even after several years, the production to be expected may be uncertain. Often a portion of a property is left undeveloped for a period of years if neighboring land owners are inactive and market conditions are unattractive. In many fields, deeper sands

4. Marsh, H. N., "Method for Appraising Results of Production Control of Oil Wells," Bull. 202, Development and Production Division, American Petroleum Institute, pages 86-100. September, 1928.

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from mill to derrick

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than those now exploited are known or thought to exist, though their development may be deferred until the upper zone or zones are exhausted. Under such conditions, any estimate of future ultimate recovery to be secured from the property will be uncertain and of doubtful accuracy.

In making recovery estimates under such conditions, a conservative attitude should be adopted in order that there may be no overestimation of reserves, leading to the adoption of too low a depletion rate. The rate to be assessed against each barrel of oil produced is not necessarily fixed in value, though it is desirable to maintain it as nearly constant as possible throughout the life of the property. If the oil and gas reserves are conservatively estimated, however, the depletion rates first established may be revised downward from time to time as the visible reserve is augmented by later development. If different portions of a property have widely divergent yields, it may be necessary to establish a different depletion rate for each portion, though this practice introduces difficult complications and should be avoided unless necessary to give proper expression to the cost of production in different areas.

The unit depletion charge is determined by dividing the total cost of securing title to and developing the property, by the estimated total volume of recovery. The depletion charges must be allocated on some equitable basis between the oil production and gas production. This division may conveniently be made proportionate to the relative gross income that may be anticipated from the two products. If, after considering all of the available information, in so far as it can be brought to bear on estimates of probable future profits, it is determined that the total oil to be produced will have a value of, say, nine times that of the total oil production, the oil production will under this plan, be assessed with nine-tenths of the total depletion charge, and the gas production with one-tenth. The value assigned to the gas production will properly include that of the gasoline which may be extracted from it. Under the conditions suggested, dividing nine-tenths of the total depletion charge by the total number of barrels of oil to be produced, gives the unit depletion charge to be assessed against each barrel of oil produced; similarly, dividing one-tenth of the total depletion charge by the number of thousand cubic feet of gas to be produced, gives the unit depletion charge to be assessed against each thousand cubic feet of gas produced. From time to time, as it becomes necessary to alter the relative values of the future anticipated oil and gas recoveries, the depletion rates may be correspondingly changed.

Some confusion has arisen among oil-company cost-accountants, due to their efforts to adapt the depletion records to the requirements of the Government income tax regulations. Up to the year 1926, the national income tax laws permitted oil companies to deduct from gross income a depletion allowance based on a valuation of their gas and oil reserves as set up on a specified date in the year 1913; or, if the oil-bearing character of the land was discovered since that date, thirty days after discovery. This practice led to the basing of depletion charges on the value of the assets rather than on their cost. This is foreign to the fundamental concepts of the purpose of the depletion charge. For cost-accounting purposes the amount to be realized in the accumulation of a depletion reserve fund is merely the cost of securing title to the property, plus the cost of its development, which bears no relation to its apparent market value at any given time. In the law of 1926, the former practice was abandoned in computing depletion for income tax purposes. The present law permits the oil producer to deduct up to 27½ per cent of his gross income during each year, in lieu of depletion, provided that such allowance does not exceed 50 per cent of the net income. This change has been made for the sake of simplicity, but the reader will appreciate that this method also, is inappropriate from the standpoint of proper cost-accounting, and that if such a method is followed for income tax purposes, a separate depletion record should be maintained for cost-finding purposes, in which the amounts written off will be in proportion to the actual depletion of the oil and gas reserves.

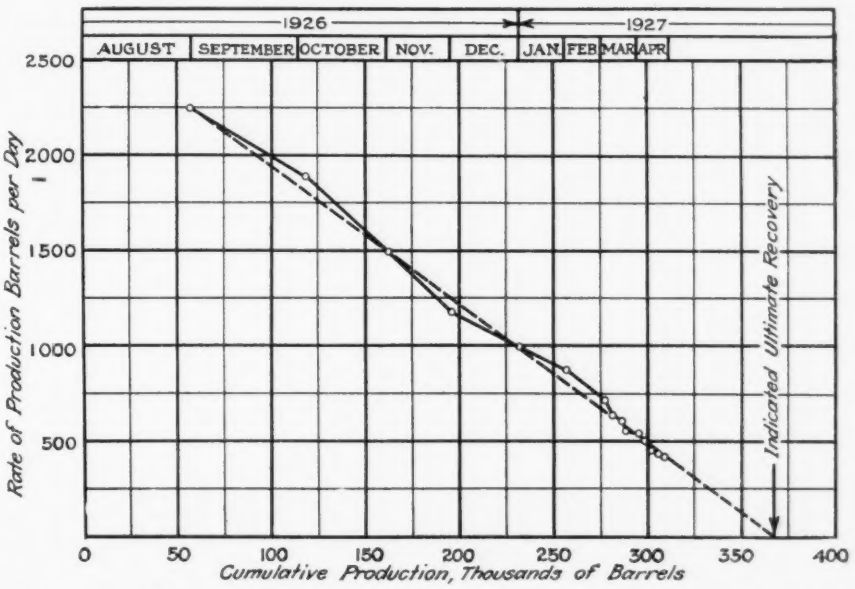

Fig. 4—Illustrating method of estimating ultimate recovery by the "rate-cumulative" type of production graph. (After H. N. Marsh in A. P. I. Dev. & Prod. Eng. Bull. No. 202)

Residual Value of Oil-Producing Land

The amount to be written off as depletion and the quantity of oil and gas over which the charge is to be spread, will depend to some extent upon the residual value of the land after it has reached economic exhaustion by present methods of recovery. If the land is owned in fee by the oil-producing company, it will always have some residual value for other purposes than oil and gas production, and this potential value for other purposes may be deducted from the cost of the land in determining the amount to be written off as depletion. The residual value of the land is thus analogous to the scrap value of physical plant.

If the oil company merely owns the oil and gas rights attaching to the land under a leasing agreement, the land may still have a potential residual value by reason of the oil and gas that is left in the sands unrecoverable by present methods of exploitation. New and very promising methods of recovery, such as pressure restoration, gas driving, water flooding and drainage through mine openings, afford a means of securing increased recovery beyond what is possible by ordinary methods. Their possible influence on ultimate recovery may appear somewhat intangible in the light of our present knowledge of these methods, but they must nevertheless be recognized and evaluated on some basis in arriving at an estimate of gross recovery and residual value of the land for future exploitation.

Well Maintenance Expense Not Properly Chargeable to Development Cost

Most oil companies are more or less continually engaged in reconditioning their wells. Well pulling and cleaning operations are of frequent occurrence and are properly chargeable against a well maintenance account. The aggregate cost of well mainte-

PROPERTY AND DEVELOPMENT DEPLETION RECORD

Emerald Lease (N.W. ¼ of Sec. 29, T. 31 S., R. 15 E., M.D.M.) 1920 to 19--

Title: Purchased in Fee, Cost $46,000.

Date:	1920	1921			
Estimated total oil production, bbls.	1,312,000	1,628,000			
Estimated value of oil production, $	2,099,200	2,848,000			
Depletion rate per barrel of oil, $	0.567	0.446			
Estimated total gas production, M.cu.ft.	1,968,000	2,237,000			
Estimated value of gas production, $	157,440	201,330			
Depletion rate per M. cu.ft. of gas, $	0.028	0.023			

Year	Cost of Property Title	Development Cost	Total Cost	Less Residual Value	Total amt. to be Depleted	Oil Production Bbls.	Gas Production M.cu.ft.	Annual Depletion Charge	Balance still to be Depleted
1920	46,000.	413,225	459,225	8,000.	451,225				
Oil						243,650.		138,150	605,850.
Gas							328,500	9,198	46,802
Total								147,248	652,652.
1921		326,440.	785,665	8,000.	777,665				*
Oil						416,380		185,705	402,484 *
Gas							678,580	15,607	26,521
Total								201,312.	428,005
1922									
Oil						196,450		87,617	314,867
Gas							346,755	7,975	18,546
Total								95,592	333,413

* Corrected Values.

Fig. 5—Typical form for "property register" record card

nance is spread periodically over the various operating accounts, so that it does not attach in any way to the capital cost of the wells. Redrilling and deepening jobs however, which are designed to permanently improve the productivity of the wells, are of a different character and may be charged against the development accounts, later to be written off as depletion.

Unproductive Development

Wells are often drilled on oil producing properties, which for one reason or another, are unproductive. Their cost nevertheless, must attach to the development of the property as a whole, and will be chargeable through depletion against the oil and gas yielded by the wells that are productive.

Property and Development Capital Investment and Depletion Record

The cost of acquiring title to each individual lease or property, together with the cost of its subsequent development, is recorded in what may be called a "property register." This record, like the register of plant, may conveniently be kept in card-catalog form. Fig. 5 illustrates a typical property register record card. It will be noted that the record also provides a means of displaying the residual value assumed for the land, the net cost to be written off, the annual depletion charges and their allocation as between oil and gas, and the remaining sums to be charged off in future.

Segregation of Depreciation and Depletion Charges

The plant and property registers are properly placed in charge of the cost-keeper, who periodically prepares a report displaying the depreciation and depletion charges to be assessed against the various departments and operating accounts. Allocations against the operating accounts should display the amounts to be charged against each individual well, both for oil production and gas production. The depreciation and depletion segregation record is prepared monthly, the depletion charges varying from month to month with the quantity of oil and gas produced. The depreciation charges however, should remain constant from month to month, unless readjustments in the depreciation rates are made as the result of plant additions, renewals or replacements, or of alterations in the estimates of residual scrap values or useful life periods.

Occasional Engineering Assistance Necessary in Fixing Depreciation and Depletion Rates

It is perhaps unnecessary to point out that the cost-keeper will ordinarily need occasional engineering advice in determining depreciation and depletion rates that will properly reflect the condition of the physical plant and the residual oil and gas content of the property. Estimates of the physical condition of the plant and the probable useful life of different plant units under the conditions prevailing, can best be made by mechanical engineers skilled in this class of work. Estimates of oil and gas reserves are customarily entrusted to petroleum production engineers capable of interpreting the decline characteristics of the production graphs. Engineering appraisals of this character may be made once each year in anticipation of giving the capital assets proper expression in the company's annual balance sheet. On the basis of these appraisals, the cost-keeper should make such readjustments in the depreciation and depletion rates as seem advisable.

Depreciation and Depletion Charges For Cost-Accounting Purposes Based Exclusively on Cost Value of Assets

In the foregoing discussion of methods of computing depreciation and depletion charges, the reader will observe that the gross sums to be provided by them should be equivalent to the cost value of the assets. This means that any increase or decrease in value during the life of the plant and property, due to changes in mar-

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ket conditions, must be ignored. The value of the oil and gas reserves may be greatly increased by increase in their selling price, but this does not alter the original cost of acquiring title to and developing them. The only way in which values of the reserves enter into the problem, is in determining the percentage of the total depreciation and depletion charges that each of the two major products shall bear.

Summary

This, the third article of a series reviewing methods of cost-accounting in oil production, is concerned with the principles and methods appropriate for computing and recording depreciation and depletion charges in the oil-producing industry. These are important elements in the cost of producing petroleum and systematic and reasonably accurate methods for spreading them over the life-period production of the oil-producing property must be adopted. The assets representing oil company capital expenditures to be amortized in this way, are classified as physical plant, land, wells and miscellaneous facilities attaching to the land. Factors entering into the depreciation of physical plant are reviewed, and it is shown that the proper basis for plant depreciation is lapse of time rather than extent of use. The "straight-line" method of computing the depreciation charge is recommended. On the other hand, it is shown that depletion, representing the cost of acquiring title to oil-bearing land and its subsequent development, is more logically distributed in accordance with the actual rate of depletion of the oil and gas reserves. Methods of accomplishing this distribution are outlined.

The fourth article of this series, describing methods of developing cost records appropriate for use in the service departments of an oil-producing company, will appear in an early issue of NATIONAL PETROLEUM NEWS.

Table I. Depreciation Rates for Oil-field Equipment Recommended by U. S. Internal Revenue Bureau†

Equipment	Average useful life, years	Annual deprec. rate per cent
Drilling equipment	4	40-25
Dehydrators,		
Electric	5	20
Pipe and tanks	2	50
Tanks,		
Steel, 5,000 to 55,000-bbl.	20	5
Steel, 2,500 to 5,000-bbl.	12	8 1/3
Galv. iron, 500 to 2,500-bbl.	12	8 1/3
Wood	8	12 1/2
Movable tanks,		
Galv. iron, 500 to 2,500-bbl.	9	11 1/9
Less than 500	6	16 2/3
Water tanks,		
500-2,500-bbl.	8	12 1/2
Less than 500	5	20
Tools	3	33 1/3
Transportation equipment	3	33 1/3
Water plants	10	10
Electric equipment	10	10
Pump stations	10	10
Buildings,		
Small wooden	10	10
Frame structure	15	6 2/3
Corrugated iron	6	16 2/3
Concrete	25	4
Brick	25	4
Steel	25	4
Pipe Lines:		
Mains over 6"	20	5
Mains under 6"	16	6 1/4
Gathering lines	10	10
Natural Gas Equipment:		
Main pipe lines	12	8 1/2
Gathering lines	10	10
Compressor stations	7	14 2/7
Field stations	4	25
Gathering stations	6	16 2/3
Meters and regulators	5	20
Natural gasoline plants,		
Compression plants*	4	35-20 15-10
Absorption plants*	4	35-20 15-10

*Assuming 20 per cent salvage value.
†From the "Manual for the Oil and Gas Industry under the Revenue Act of 1918," by R. Arnold and J. L. Darnell, U. S. Treasury Dept., Bureau of Internal Revenue, 1921

TABLE II. Average Useful Life Periods for Different Classes of Physical Plant in Public Utility Industries*

Equipment	Life in Years
POWER PLANT EQUIPMENT:	
Gas engines	10-15
Corliss slow-speed engines	25-30
High-speed engines	15-20
Pumping engines	20-40
Boiler feed pumps	15-20
Geared power pumps	20-30
Centrifugal pumps	20-30
Boilers, fire-tube	10-15
Boilers, water-tube	20-30
Heaters	20-30
Condensers	20-30
Jack-shafts	20-40
Piping	20-30
Leather belting	20-25
Generators, motors	20
Static transformers	20
Turbo-generators	20
Switch boards and wiring	20-30
Storage batteries	10-15
BUILDINGS:	
First class, stone and brick	75
Second class, shops and power stations	50
Frame dwellings	35
Frame stables and sheds	25
GAS PLANTS:	
Centrifugal blowers	15
Cast-iron mains	50-75
Wrought iron and steel mains	30
ELECTRIC TRANSMISSION LINES:	
Copper wire (insulated weather-proof)	10-15
Cable, lead-covered, aerial	10-15
Cable, lead-covered (underground in conduits)	20-25
Conduit	30-50
Poles, cedar in earth	10-18
Poles, cedar in concrete	12-20
Poles, iron in concrete	15-30
Pole anchors and guys	10-20
Cross-arms	10-15
Transformers	10-15
Fuse boxes	10-12
TELEPHONE EQUIPMENT:	
Copper wire	20
Weather-proof iron wire	15
Telephones	10
WATER-WORKS:	
Suction piping and intake	30-50
Stand pipes	30-50
Reservoirs	50-100
Wells, driven or drilled	50-75
Filter beds	30-50
Cast-iron pipe, large diam.	50-75
Cast-iron pipe, small diam.	20-40
Steel pipe	25-50
Wood-stave pipe	20-30
Hydrants and gates	40-50
Pumping and auxiliary machinery	20-30
MISCELLANEOUS:	
Air compressors	20-25
Steel stacks	15
Brick stacks	35
Shop tools and machinery	10-50

*Compiled by a committee of the American Society of Civil Engineers.

Repressuring Used In Burmah Fields

LOS ANGELES, Dec. 3.—That repressuring is being resorted to in Burmah with satisfactory results, is the word brought to California by W. E. V. Abraham, member of the geological staff of the Burmah Oil Co., Ltd., who is making a study of oil field practices in California.

Mr. Abraham attended the November meeting of the Pacific Coast section of Development and Production engineers, American Petroleum Institute, in Los Angeles.

He referred briefly to development problems in Burmah and laid special stress on the importance of a determination and realization of the actual quantitative value of gas conserved in an oil sand. In Burmah this subject had been approached from the repressuring point of view.

Attempts had been made to determine the additional quantity of oil recovered as the result of the injection of 1000 cubic feet of gas into an oil sand, distinguishing as carefully as possible between what was actual ultimate increase and what was merely accelerated production. The argument was then used that 1000 cubic feet of gas conserved in an oil sand (by suitable application of back pressure, avoidance of vacuum, etc.) was likely to benefit ultimate production to at least as great an extent as 1000 cubic feet subsequently injected. If this were agreed, a minimum value for conserved gas was arrived at and this gave some sort of basis for decisions regarding the uneconomic use or wastage of gas.

Savings Effected in Unit Repressuring Of Old Oklahoma Field

By I. L. Dunn* and James O. Lewis*

Presented before American Petroleum Institute, Chicago, Dec. 3-6

THE accompanying article is the first detailed description to be offered oil operators of the organization and operation of the cooperatively-owned Delaware Consolidated Oil Co., in the Delaware Extension pool, Nowata county, Okla.

Much is heard today of unit operation of oil fields in all stages of their development. Messrs. Dunn and Lewis, authors of this article prepared for presentation before the American Petroleum Institute meeting in Chicago, are responsible for the organization of this unit company and are today its field managers.

They started their work in this pool in 1923. They previously operated a unit formed in the Lenapah pool, also in Nowata county. Beginning in 1912, their experience with repressuring old properties in eastern fields convinced them of the desirability of operating a pool as a unit.

Among their general conclusions they point out that property owners, in considering unit operation, must be convinced on three principles: first, that unit operation will bring larger profits; second, that competent management is assured; third, that equities in the cooperative company are fair to the individual property owners.

It is seldom possible to secure complete consolidation of a pool by voluntary agreement, especially among royalty owners, their experience has taught them. If complete pooling is to be achieved, in their opinion, it will be necessary to provide legal means enabling a majority opinion in a pool to compel an obstructing minority to enter into the agreement.

THE primary purpose of this article is to show what the writers' experience has taught with regard to unit operation in repressuring old properties. In order to bring out the advantages and disadvantages, it is desirable to detail some of the experiences encountered in effecting consolidation and in operating the combined properties afterwards.

As the human element is a very important factor in effecting unit operation, it will be necessary to deal with the personal element more than might at first seem justifiable in a technical article. This necessity becomes apparent when one considers that the technical arguments for unit operation are wholly favorable, whereas the difficulties of effecting consolidations and the apprehensions as to the success of unit operation are based upon legal and human factors.

As may be seen from the map (Fig. 1) the Delaware Extension Pool is a narrow irregular strip some eight miles long. Production is found in a lens of Bartlesville sand which passes into impervious shale north and south of the pool. On the west end the sand body becomes discontinuous and production terminates at the point shown on the map. On the east end, the Delaware Extension pool is separated from the Childers pool by an area of thin shaley sand. The pool is thus isolated.

The Delaware Extension pool was first drilled in 1911. Production was found at a depth of 700 feet on the east end which increases to 1200 feet on the west end. In parts of the pool wells up to 1000 barrels initial production were found. Vacuum was applied about 1916 by 1926, when the pool was consolidated, the average of the wells had dropped to one-third barrel per well daily.

By that time the properties were, for the most part, in a dilapidated condition; operations were profitable only during periods of high prices; the pumping equipment and lease tanks had not been kept up and corrosive water had eaten through the casing in many wells and threatened to destroy the remaining wells within a few more years.

In 1923 first proposals were made for consolidating these properties, the suggestion being that, inasmuch as these properties, in common with most other properties in this part of Oklahoma, had almost reached the economic limit, it was desirable to repressure; but that division of ownership in this pool, which had a fairly open sand, would not permit satisfactory repressuring without all or at least a majority of the property owners cooperating. It was further represented that the only satisfactory way for cooperation was to pool the properties into one common interest to be operated under one management.

After many months of negotiation, a concrete proposal was made that a new company be formed to which the property owners would sell their holdings and receive stock in accordance with the relative values of their respective interests. The method of valuation proposed was that each property be valued on the basis of its daily net production. An arbitrary value per barrel was placed on all oil production, and relative values were set on gasoline production, royalty interests and surface ownership. An adjustment had to be made for properties with most wells not pumping. Extra equipment was either left in the hands of the owners or was purchased at an agreed price.

It is worth while to mention three other methods which have been used elsewhere for setting comparative values. One is to set the relative values on the producing wells: thus, if the total is 1000 wells and the lease has 50 wells, it acquires a 5 per cent interest in the whole.

Another method is to combine the two others. For instance, if the group of properties had a total of 1000 wells and 500 barrels of production, and the lease being valued had 50 wells and 50 barrels of production, it would be appraised as follows (assuming no other items such as gasoline plants, etc.):

$$\text{Value of wells} \quad \frac{50}{1000} = 5\%$$

$$\text{Value Production} \quad \frac{50}{500} = 10\%$$

Average 7½% Appraised Value

The third method was to submit the problem to a disinterested ap-

praiser satisfactory to all concerned.

The proposal for large and small companies to get together to form a new corporation, to pool their properties and to surrender management at first created considerable doubt. It was a departure from previous policies and the experience of both companies and individuals had led each to the conclusion that divided interests were undesirable; hence, each property owner wished to operate this property without having to consult anyone else.

There were also many personal angles which arose. The viewpoint and necessities of the large companies and of the individuals were not the same, nor were the viewpoints the same for all individuals or for all companies. It is not possible in this article to go into all the personal angles that arose. The position the writers maintained was that these objections, no matter how valid they seemed, were of minor consequence when compared with the gains which could be had in consolidating their interests.

The method of appraising these properties was questioned. Each property owner was inclined to think that the natural conditions under his property or the condition of his equipment was such that it was worth more per barrel than his neighbor's and it was also maintained that some properties would respond more to repressuring than others. Our answer was that undoubtedly there was merit in these objections in many cases, but that the only practical way was to apply some simple approximation and for each one to take his chance of getting an average deal.

It was pointed out that good equipment and good operation meant a comparatively large present daily production and therefore a higher appraised value, but on the other hand there would probably be less oil

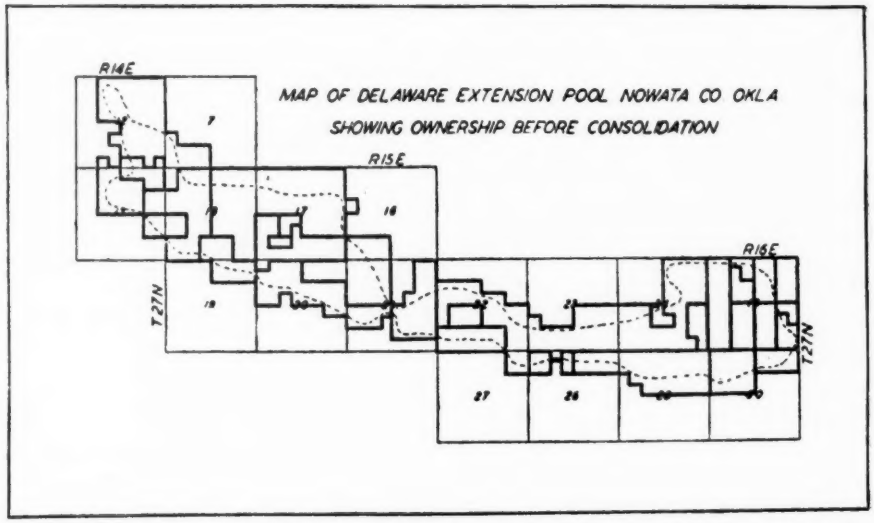

Fig. 1—Map of the Delaware Extension pool, in Nowata county, Okla., showing ownership before consolidation of a large number of the producing properties there into the cooperatively owned Delaware Consolidated Oil Co.

under the property than in one which had not been kept up; thus, to a considerable extent at least, the advantages of the well equipped and well operated property were compensated by the smaller daily production but probably larger reserves of the poorly equipped and poorly operated property.

Similarly it was said that the financial results of repressuring over the life of each property could not be accurately foretold and that the results from individual operation for a particular lease might be entirely different in results from the same property when operated as a part of a large unit.

It was further represented that the total profits from operating as individuals would be much less than the total profits, from operating as a unit and might be the difference between financial failure and success so that on the average property owners would certainly gain, and it was doubtful if any would get less than if he had "gone it alone."

After considerable discussion, which went on for over two years, consolidation was finally effected for approximately two-thirds of the properties in the Delaware Extension pool. At times it looked as if the consolidation would be complete, but for various reasons several of the smaller concerns finally withheld support. Since the date of consolidation, some of the small interests have come in or have been purchased, and some of the outstanding interests have consolidated in another small unit, the Henderson Oil Co. At the present time there are six interests in the pool, whereas originally there were 19.

After consolidating a majority of the lease owners, an effort was made to pool the royalty interests. The first proposal was that the royalty owners also come in as stockholders and receive twice the stock for a daily barrel of royalty oil as for a barrel of working interest oil. Little progress was made on this proposal, as the royalty owners objected to turning in an expense free interest for an interest that would entail participating in the expenses of construction and operation even though it was pointed out that, in compensation, they would acquire an interest in the physical property which was at the time worth nearly as much as the oil production.

The second proposal was that the royalty owners make a separate pool of their own interests. For convenience the pool was divided into east and west units. If a royalty owner had an eighth royalty on a certain lease with a royalty production of 1 barrel daily out of a total of 10 royalty barrels for the unit, he would acquire an undivided 10 per cent interest in the royalty underlying all of the unit. This proposal met with better reception but finally just

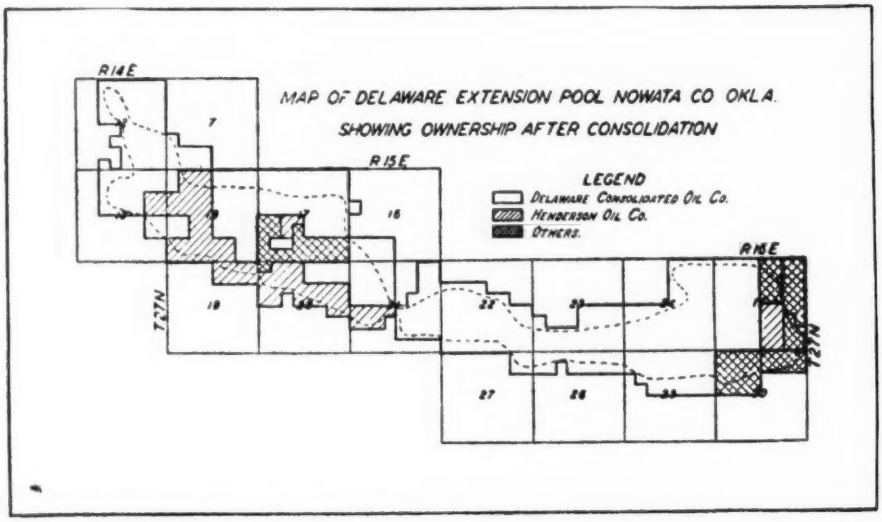

Fig. 2—Showing the ownership of properties in the Delaware Extension pool after the consolidation of properties. Five miles of the eastern and central portion of the pool are wholly owned by the Delaware Consolidated, whereas there are still several individual interests in the western portion

failed of obtaining the consent of the minimum of 80 per cent of royalty interests though the writers believe that had they been able to devote more time to personal interviews, the pooling would have been consummated.

The desirability of pooling royalty interests is obvious. It would do away with all questions as to drainage between properties. It would permit fewer tanks with a lessening of expense and evaporation losses; reduce bookkeeping, and lessen other expenses and troubles in many ways. The individual royalty owner would gain by increased recovery, by bettering the quality of the oil, by spreading his chances and by making gasoline recovery profitable. On the other hand he would be taking chances that his own property would show a better increase than the average. The failure to pool royalties has increased expenses in many ways but so far no serious trouble has been experienced with royalty owners.

The Delaware Consolidated Oil Co. is a simple corporation that has but one class of stock (Common) and has the usual board of directors elected by the stockholders. The former owners of the properties became stockholders in the new company and have the usual rights including the buying or selling their stock in whole or in part. The management is in the board of directors, the firm of Dunn & Lewis being employed since the beginning of operations as field managers, but this arrangement can be terminated at any time by either party. The Delaware Consolidated Oil Co. is thus operated separately from any of the companies which own stock interest.

Fig. 1 shows the previous divisions in the pool and Fig. 2 shows the division of interests at the present time. It will be observed that in the eight miles of the pool, five miles of the eastern and central portion is wholly owned by the Delaware Consolidated Oil Co., whereas in the western part of the property there are several outstanding interests.

This segment in the eastern part of the pool is substantially a complete unit, whereas the west end of the pool is only a partly consolidated unit. The comparative experience in the two parts of the property has been particularly valuable in showing in a practical manner the advantages of unit operation in comparison with divided operation under otherwise like conditions. All the property of the company is repressured from one plant under one management; thus, side by side, the writers have been able to compare the two conditions of operation.

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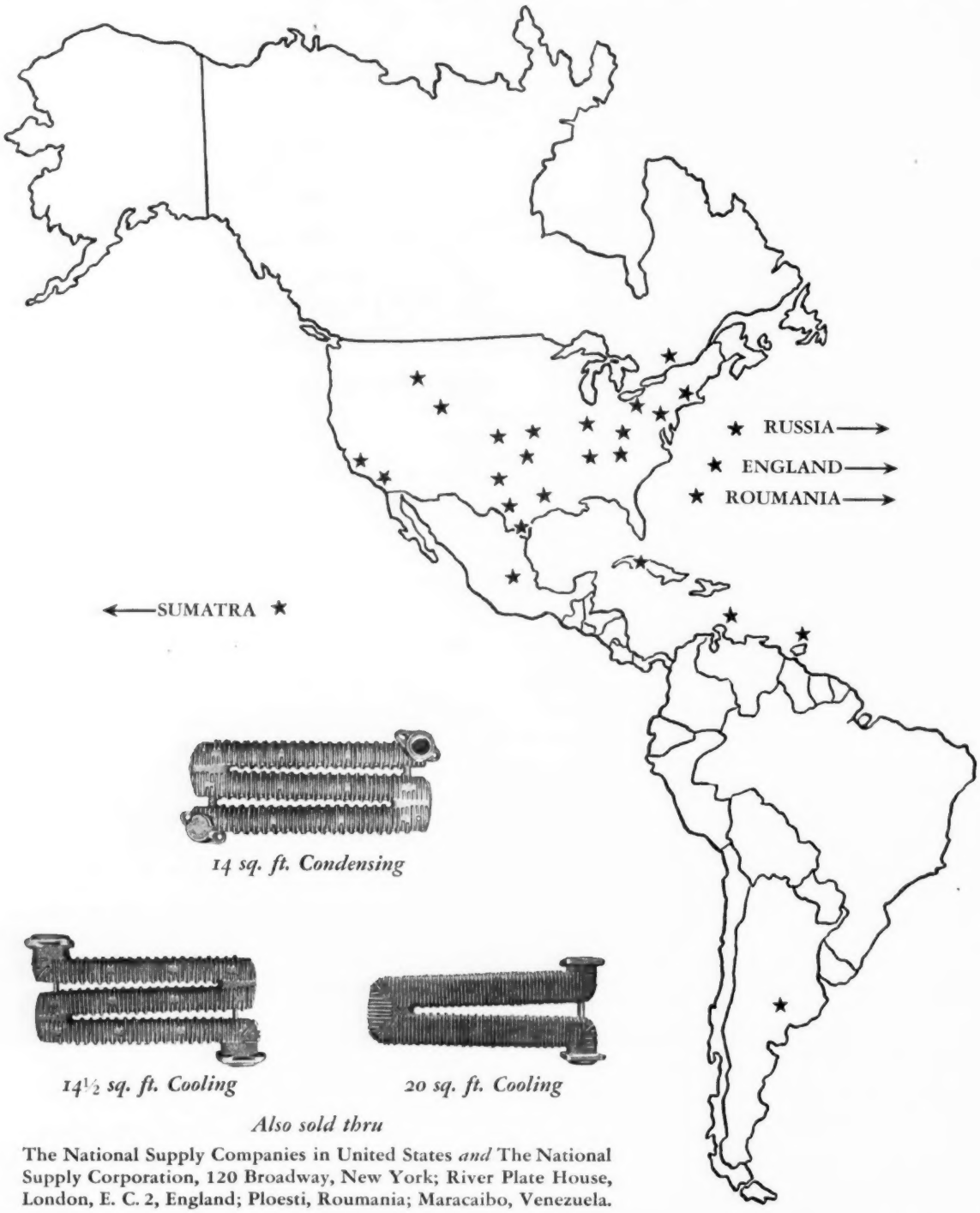

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the best water supply in the field. The plant was first designed to supply pressure only to the east half of the property. Results of repressuring are shown in the graph (Fig. 3). When the construction of the plant was about completed, the wells in this part of the property were opened to the atmosphere so that production was off for nearly three months, during which time air was also being forced into the pressure wells. Meanwhile tests were made on the wells which indicated that an area of very open but productive sand wound irregularly through the pool.

After pressure had been applied for several months, it was found that this loose streak was taking practically all the pressure and in some places by-passing had started and was threatened in still others. To control this situation two methods could have been used. One was to cut down the input on the air wells feeding this strip, the other was to build up back pressure on the by-pass wells in the strip.

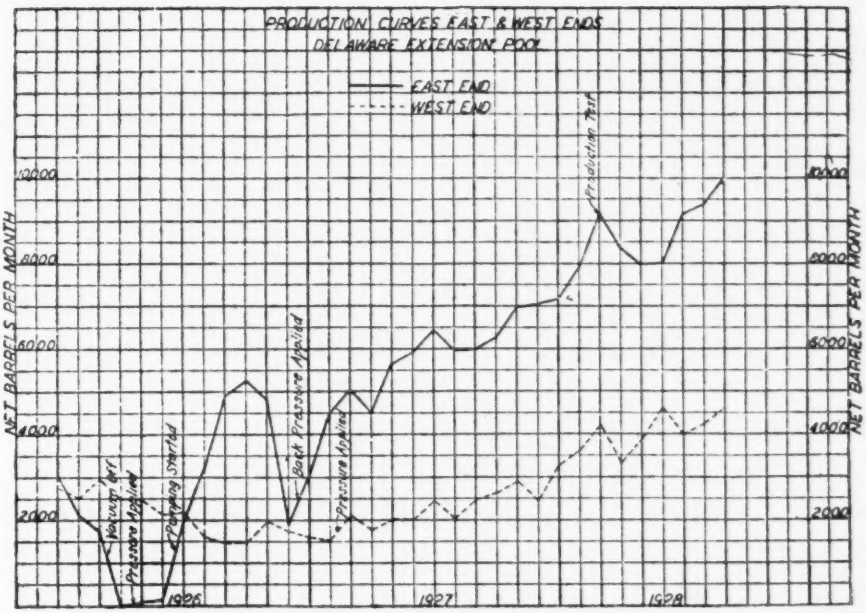


Fig. 3—Results of repressuring in the unit operation of the Delaware Extension pool. Methods which could be employed in the west end of the pool, because of the effect on neighboring individually owned properties, allowed for a much smaller increase in production than in the east end of the pool, which is entirely owned by the cooperative company

For several reasons the latter course was chosen as in the end being the more practical and desirable under the conditions in this part of the property. At the present time back pressures as high as 180 pounds are being carried on some wells. This procedure illustrated at once the advantages of consolidation, for had the properties not been pooled this choice would not have been possible.

Later in the application of pressure to the extreme east end and to the west half of the property, the second course had to be pursued where by-passing was threatened, as the holding of back pressure on producing wells would have forced production onto adjacent properties.

Back pressure was applied to certain pumping wells while others were completely shut in for a period of three months. As the properties on which wells were back-pressured were likewise the ones that had responded first, the production was cut down for about two months as is shown in the accompanying Fig. 3. From time to time since, the back pressure has been raised on these wells or has been applied to other wells until some wells are now under back pressure as high as 180 pounds with an input pressure varying between 225 and 250 pounds.

The method has to our minds been eminently satisfactory as it has enabled the entire property to be operated at the same pressure from the same plant and same pipe line system. The seeming loss in pressure resulting from holding these high back pressures has been regained by flowing the wells and by other methods. With passing time these properties which first had to be closed in, in all but one case, have regained and then passed their previous maximum productions without further trouble from by-passing. Examples of some of the properties which threatened to give most trouble are shown in Fig. 4.

After a successful demonstration on the east half of the property, three more units were added to the compressor plant and the program of repressuring the west end was undertaken. The difficulties of repressuring under divided ownership at once came to the fore, though the difficulties were mitigated materially by establishing cooperation with the Henderson Oil Co., which had consolidated several interests and purchased others. The cooperative arrangement provides simply that the two managements shall agree to alternate pressure wells along the lines and to inject the same total quality of air into the line wells.

Notwithstanding the cordial and intelligent cooperation from the Henderson Oil Co., the disadvantages of divided ownership of the pool have been very evident. The disadvantages of divided ownership in a pool are similar in many ways to the disadvantages of undivided interests in a single property to which the oil man through many unfortunate experiences is always averse. The Delaware Consolidated Oil Co. had to wait until this agreement had been arranged and until the Henderson Oil Co. was prepared to go ahead with their part of the program. In spite of the agreement as to putting in equal volumes, there must of necessity be careful operation along the property lines to see that the respective interests are protected.

On the east half of the property, when a problem is confronted, the solution lies almost solely in what is to the best interests of the pool, but on the west end of the property, account must be taken of what will be the effect on the neighbor's property. The Henderson Oil Co. is faced with the same situation. Each company is making every effort to carry out their agreement in entire good faith and as far as possible to look at their respective problems as a matter of common interest, but there is a clear limit placed upon the operation of the properties by reason of self-interest, which the writers do not see any way to overcome. The results are shown strikingly in operating the east and west end of the properties by their respective production records. (See Fig. 3.)

There being no operating agreement with the third interest in the west half of the pool, it has been necessary to continue vacuum and to repressure around their property in such manner that oil is not forced onto it. (See Fig. 2.) The only vacuum now in the Delaware Consolidated pool is on and around this outstanding interest. The considerable expense entailed is wholly unnecessary from the standpoint of oil recovery alone, but it is a necessity under the conditions which prevail. In effect it will be inadvisable to repressure within two locations around this property for as long as this condition continues.

The west end of the Delaware pool has every appearance, from its natural conditions, of being fully equal if not better suited to repressuring than is the east half, but the dissimilar results are clearly shown by comparing the two curves in Fig. 3. The application of pressure on the west end started in May, 1927. By no means has the maximum result been reached for the west end of the property under the present operating conditions; nevertheless, it is clearly

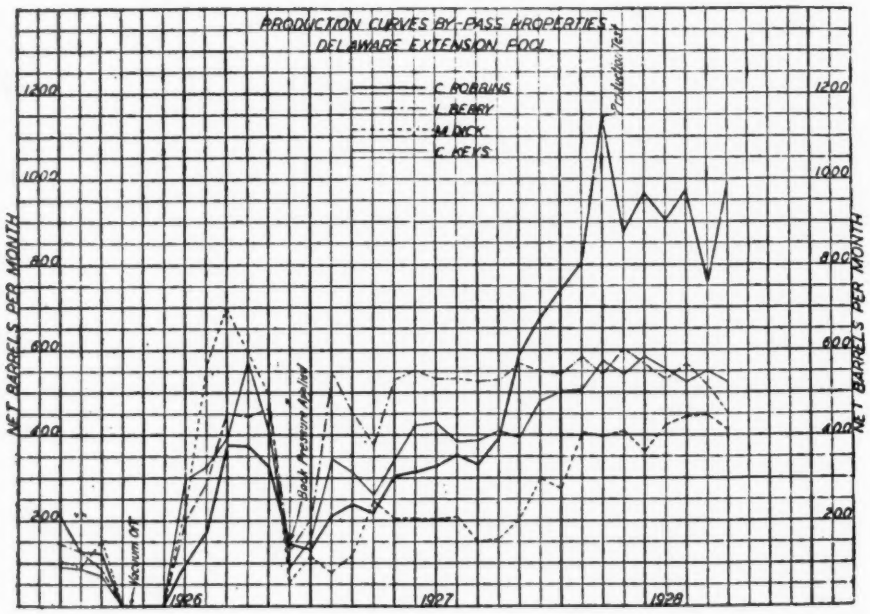


Fig. 4—Production curves on properties where wells had to be shut in, or operated under considerable back pressure, for a time because of by-passing to them of the air forced into the ground in the repressuring operations. Eventually these properties regained and passed their previous maximum productions

evident that the same increase cannot be expected for this part of the property for so long as the present division of interest continues. Time and again the application of methods which were giving good results have had to be modified or discontinued because of the effect on either one or the other of the neighboring properties. As a result, the west end has increased hardly more than 50 per cent after nearly two years, whereas the east end has increased 350 per cent.

The causes for this interference of operation are many. They concern primarily the fact that the movement of the oil and the air is irrespective of surface property lines. The threatened by-pass troubles on the east end have been described but the remedy which proved so successful there cannot be used on the west end at all. Imagine holding a back pressure of 180 pounds on a line well offset by a well under vacuum, both producing from the same open sand. When it is found that increases are approaching the line wells offsetting the property with which there is no cooperation, it is necessary to cut down the pressure and therefore to cut down and curtail results. This difficulty is of course not so marked along the lines where there is cooperation.

Nevertheless the interests of both parties is to cut down on the pressure wells which seem to be shoving oil across the property line and to make up the total by increasing the amount of pressure going into the wells which seem to be shoving the oil toward the interior of the property. Moreover, difference in opinion as to proper method of operating the wells makes it difficult and sometimes impossible to arrange for a manner of operation which would permit the use of back pressure as used on the east end.

Such difficulties and hindrances come up in so many details that only those who have had the opportunity to compare the two methods of operation side by side can appreciate the cumulative effect. It is impossible to show all these factors by any set of figures and the writers can only state that their experience in this pool has confirmed their previous statements and intensified their feelings as to the desirability of unit operations. The evidence of these difficulties is shown in the respective curves of the east and west ends, even after allowances have been made for the fact that the west end has by no means approached the maximum benefits under existing conditions.

It is pertinent to mention here some of the proposals that have been made for effecting cooperation along property lines without the pooling of interests.

In many cases new pressure wells have been drilled on the property line at joint expense on the theory that the pressure will drive the oil equally from the line to the wells of each of the abutting properties, but there is no assurance that the air and oil will go equally in the two directions; in fact all experience shows this is unlikely and the writers have repeatedly observed instances where the pressure has traveled entirely in one direction. Moreover, it prevents one operator from using needed back-pressures if the other will not operate in a like manner. There is seldom any advantage in this effort to mitigate natural conditions and the cost of the new well therefore represents a needless expense.

It has also been proposed to keep equal rock pressure on the two sides of the line, this being determined by periodically shutting in the pressure wells till the pressure ceases to drop. This proposal is based upon the supposition that, if equal pressures are opposed on the two sides of the line, there will be no movement across, but this will be true only where there is uniformity of conditions, which of course rarely occurs. The movement of air or gas through the sand depends upon two factors, first the pressure applied, second the resistance in the sand. To control the pressure does not assure equal resistance. For purposes of illustration an exaggerated condition is supposed in Fig. 6. It may be seen that the pressures on properties A and B may be the same, yet all the movement be towards B.

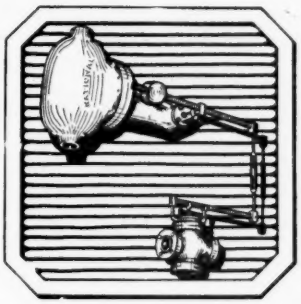
These and all other efforts to equalize movements across property lines are confronted with the unalterable conditions underground, whose unfavorable effects may be mitigated but not controlled, and in seeking equality of results the tendency is to operate in the least effective manner. Such cooperative efforts beget differences of opinion and occasion delays, demand compromises, and cause expense. They create a situation of dual control that wherever encountered, in business, in government, in oil fields, in factories, or wherever they may be found, have always resulted in delays, expense and inefficiency.

The advantages of unit operation divide themselves into two sets of factors; one is based upon the competition for the common supply of oil and gas in the pool, and the other concentrated operation on a larger scale. By the latter is meant the well known fact that operations on a large scale permit many economies and present many advantages when conducted under able management, but to gain these advantages the operations should be concentrated.

The Delaware Consolidated Oil Co. is operating 490 wells, all in one pool and under one farm boss. This condition is entirely dissimilar to a company which may have the same number of wells but scattered among many widely separated leases.

The advantages of such concentrated operation on a large scale are so well known that it is unnecessary to devote much space to proving them, but it seems desirable to present some concrete evidence of such advantages for this pool.

As stated previously, the Delaware properties extend over a length of eight miles. There are in all 4140 acres of property, on which a total of 629 producing wells have been drilled. At the present time there are 34 air wells, 286 wells pumping, and 170 wells with casing eaten through which are not now pumping. A program is under way to reclaim these 170 wells and eventually perhaps 50 of the 139 abandoned locations will be redrilled. This gives an



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The first evidence of the advantages of large scale operations was in the construction of the pressure plant. At only one place on the property was there a water supply adequate for satisfactory running of compressors. The construction of a single plant located at this site rather than many small plants has greatly reduced the total investment. Our experience has been that it costs about $125 per horsepower for a small pressure plant, whereas the expense in this instance has been $90 per horsepower, with a total saving to date of approximately $45,000, based on this standard of comparison.

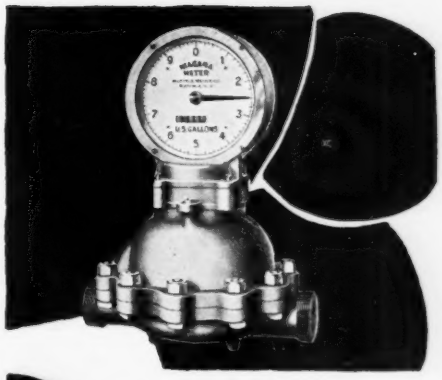
The saving in cost may be shown in another way. Our experience in the Mid-Continent and other fields indicates that, for a smaller property of otherwise comparable conditions, say of 50 wells, the cost of applying pressure, including the pressure plant, gas gathering lines, pressure wells, and other costs directly concerned with repressuring, will average $500 per well, whereas the same cost on this property will be around $250 per well.

The repairs of wells, tanks, and other production equipment is not included in this figure, as this cost is not part of the pressure plant construction and is being charged to current lifting expense. It may be seen that a saving of approximately $125,000 is indicated from putting in one system covering 500 wells instead of 10 plants each covering 50 wells. The actual savings over what would have been done under divided ownership cannot of course be closely estimated but it doubtless would have been some place between these two figures.

Operating on a larger scale has also permitted the utility of second-hand equipment in a way which would not be possible on a small property. A welder has been employed constantly and his savings have been a large but unknown amount. The pumpers have been reduced from 15 to 8, although production is now three times as great—each man now pumping 63 barrels daily instead of 12½ barrels.

Pumping expense, exclusive of reclamation work, construction and air plant expense, has been reduced from $4400 to $2100 monthly, and pumping expense (not lifting expense) has been reduced from 83 cents to 17 cents per barrel. The concentration of operations has permitted the working out of many new things around the compressor plant and the property which a small operator could not undertake.

The problems represented by deteriorated equipment were found to be fully as important as repressuring. Under the previous conditions there was not enough profit to maintain equipment. The new conditions gave



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prospects for another 20 years' production and this required that the property be completely rehabilitated. Corrosive water from the Oswego lime found 400 feet above the producing sand had eaten through the casings of 210 wells which were not pumping, and 30 new wells have gone to water since. This presented a practical problem which had to be overcome economically, otherwise the property would be a financial failure, even though a large increase in oil could be obtained.

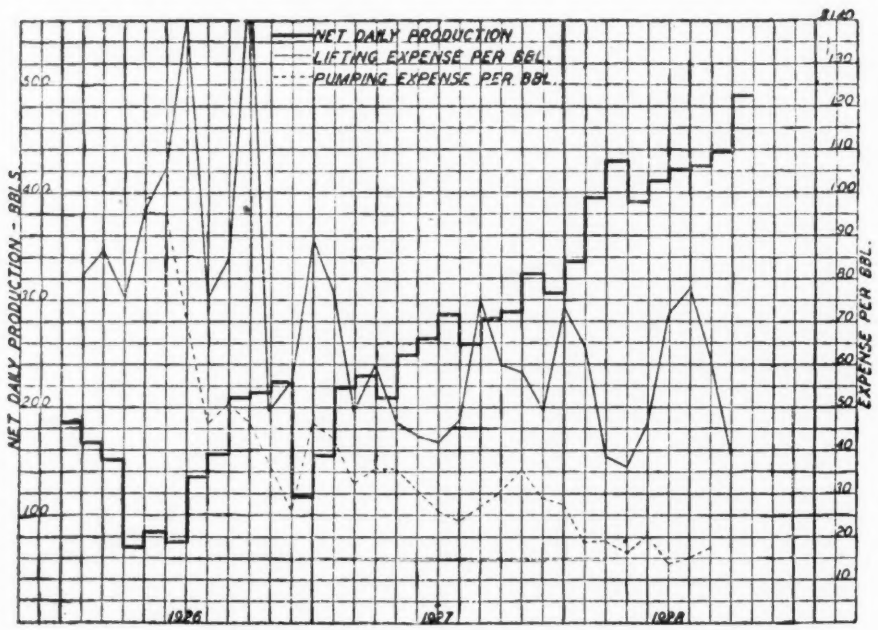

Fig. 5—Lifting expense, pumping expense and net production on properties of the Delaware Consolidated Oil Co. charted graphically for three years. Savings in operating expense through concentrated operation of properties is responsible for the decreased lifting costs

A satisfactory method was worked out for recasing the wells with small pipe and reclaiming the old casing in the wells. Eighty-five wells have been reclaimed as air wells or pumping wells and two crews are now working continuously on this program, which will take at least two more years to complete. Once reclaimed, the wells are expected to outlast production. The cost of recasing the oil wells including cleaning out with air, mudding the new pipe and pulling the old pipe will average $450 in first cost. The reclaimed pipe is used on the property or sold and the net cost, allowing current prices for such second pipe, will not exceed $250. As the cost of reclaiming and cleaning out wells by previous methods would probably average $1000 the savings will eventually amount to several hundred thousand dollars. The cost of reclaiming these wells and also repairing tanks, powers, etc., is being charged currently to lifting expense, which nevertheless has decreased from 83 cents to 56 cents per barrel.

This description of the method and cost of reclaiming wells is cited as one example of an advantage accruing from operating on a large scale in one district. Similarly every lease house has been rebuilt, every tank has been redecked and repaired, and the old gas engine powers are now being replaced with old drilling engines, which will be placed on the property at $60 each (salvage value may change this cost to a profit), and will be run by air pressure; thus, effecting a large economy both in initial and operating expense and permitting an increase in production. However, the use of steam engines in this manner is a temporary expedient to bridge the gap between present conditions and the ultimate plans. At present 12 wells are being flowed and experiments are going on towards the working out of a method and system of putting all the wells to flowing.

In addition to these improvements, the large scale operations permitted the development of others which ultimately will greatly reduce operating expense or increase the total recovery. They include an automatically controlled air-lift for circulating water at the pressure plant, automatic shutdown protection to the compressors, methods of utilizing the air-gas for fuel and two safety devices that permit the return of the air-gas to the ground.

The latter are of especial importance. The use of gas is almost prohibitively expensive for such a property and unless the air-gas is returned to the ground, it will in time get too lean for fuel. Moreover, the use of air alone for repressuring does not eliminate hazards, for more trouble has been encountered in the west from the ignition of lubricating oil, which has been carried from the compressors into the air lines, than from gas-air mixtures. These two devices make explosions almost inconceivable.

In Fig. 5, the lifting expense, pumping expense, and the net production are shown graphically. During the first two and one-half months in 1926 the operating of the leases was under the previous owners of the property. This gives a comparison of the lifting expense under the old and new conditions and increased productions. But the significance of the present expense can be gained only by an itemized analysis of the lifting expense, which includes not only the usual pumping, pulling of wells, and running of the oil, but also the operation of the compressor plant and the reclamation and repair of wells, houses and tanks, powers, previously mentioned.

Analysis of Lifting Expense First Seven Months 1928

Pumping	$ .170 per net bbl.
Air plant proper	.095
Vacuum plant	.005
Reclamation gas lines and additions to air lines	.165
Reclamation of wells	.095
Reclamation of tanks and houses	.030
Total Lifting Expense	.560 per net bbl.
Estimated Reclamation Expense	.27
Estimated Regular Lifting Expense	.29

The "regular lifting expense" consists of pumping expense, air-plant and vacuum plant expense, and an allowance of 2 cents per barrel for ordinary maintenance. On this basis the average "regular lifting expense" for the seven months would be $3,700 as compared to the average lifting expense for the two months of prior operations of $4,417.90, thus indicating a reduction of $717.90 under what may be termed "normal expense" in spite of the fact that the expense of operating the air plant has been added.

A comparison of the production and expense of the two parts of the property is suggestive. The averages for the three months of June, July, and August follow:

	East End	West End
Air wells	18	15
Wells producing	138	154
Net production monthly	8,830 bbl.	4,292 bbl.
Total lifting expense monthly	$3,559.50	$4,171.98
Lifting expense per bbl.	$ .413	$ .970
Lifting expense per well per mo.	$ 25.79	$ 27.09 (pumping wells)
Daily production per well	1.84 bbl.	.83 bbl.

It will be observed that the expense per well is substantially the same on the two parts of the property, the reduction in the lifting expense per barrel on the east end of the property resulting from the increased production per well. Considering the whole property, the "regular lifting expense" has averaged $13 per well monthly (producing wells) for the first seven months of 1928. Exclusive of the air plant expense, the expense was $8.50 per well month (producing wells), whereas the similar expense was $15.80 per well month for the two months prior to repressuring.

These figures show that, except for

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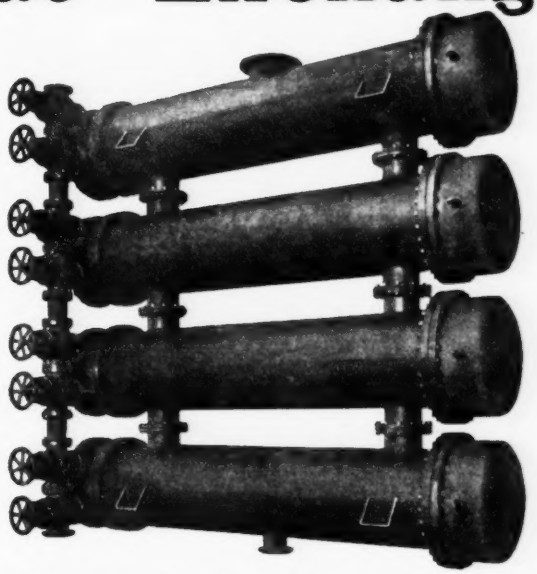

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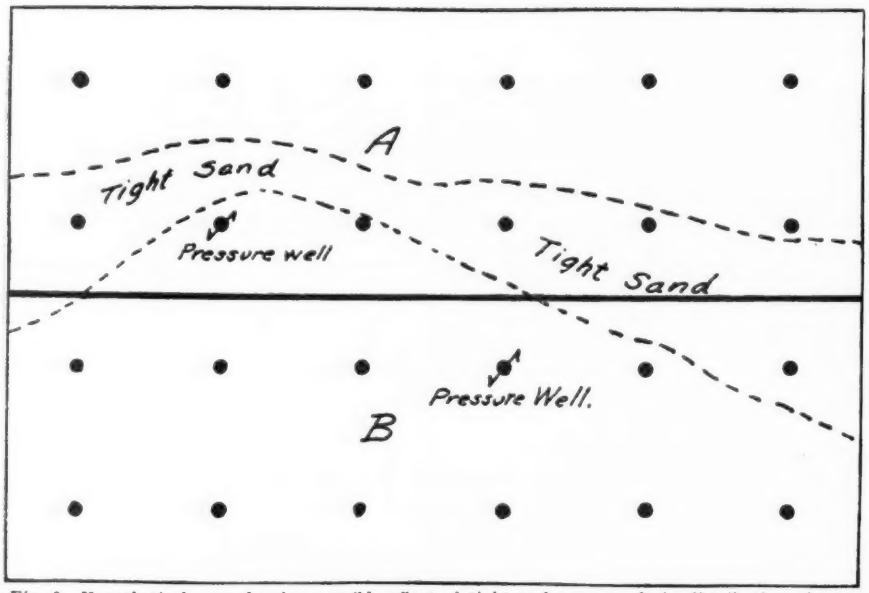

Fig. 6—Hypothetical case showing possible effect of tight and open sands in distribution of pressure across property lines. Practically all the benefits in this case would accrue to Property B even if pressures were kept the same on the two sides of the property line

the cost of rehabilitating the deteriorated equipment, the cost of operating wells on such a repressured property can be kept below former expense, and the expense per barrel can be greatly reduced if good increases in production are obtained.

The above analyses show how the whole property is being rehabilitated out of current lifting expense, which is nevertheless considerably lower per barrel than under the old conditions. As the former property owners included some of the best operators of old properties in the Mid-Continent, this reduction in per barrel expense can be fairly attributed to the changed conditions on the property. Moreover, the lifting expense consists in major part of items which are in reality additions to property and which will not be continued beyond the reconstruction stage.

The future expense on the property is to be gauged by the expense less the reclamation cost. It will doubtless take another two or three years at the present rate of repair to completely rehabilitate the property, at which time the property will be in such shape that maintenance should be a comparatively small item for years to come. At that time the production should also be considerably larger than at present and it may be expected that a lower pumping expense can then be shown. The same conditions will apply to the overhead expense which now is rather large and will continue large during the reconstruction stage.

The foregoing statements show how the construction and reconstruction on old properties can be done cheaper in large units but there are many advantages which cannot be shown in figures because there can be no figures on what would have been done had the properties been repressured separately.

One other phase of the situation shows up clearly from the experience of the Delaware Consolidated pool. Along with the good properties were many "cats and dogs"—leases which either were too small for successful operation or had too many wells abandoned, or had hard, thin or shaley sands. Such properties could not be profitably repressured by themselves and the owners would have had to abandon or sell them in either case with probable loss to their owners. In spite of the claims of some engineers that any property with an inside location is a potential repressure property, the fact remains that such small properties can seldom be handled profitably and never can realize full profits.

Lean sand properties can seldom be operated profitably alone and one company is now engaged in abandoning some 50 lean properties in northeastern Oklahoma, yet most of such properties could be operated at a profit if consolidated with good properties in a large unit that would permit construction of a repressuring system and reduce the unit expenses. In this manner such old production could be saved.

It is worth while to discuss the bearing of this experience upon the consolidation of other pools. It is obvious that, except for the lack of precedence for the proposition, a consolidation of such old unprofitable properties offered less difficulties than consolidating a pool where the properties were still profitable, particularly during the early stages of development when the values remain largely unproved. The principles are in both cases the same, but the practical details of consummation are subject to the conditions found in each pool.

To get a background for considering the principles referred to, it is necessary to put one's self in the position of a property owner. Before any of us would be willing to surrender our property to a corporation, we would want to be convinced that this step would result in greater gain than by continuing operations separately. As a property owner, we would first want to be convinced that unit operation was technically correct and would permit larger profits. We would then want to be convinced that the new management would be competent to take full financial advantage of the technical and practical opportunities offered by unit operation and would be fair and impartial to all interests. Thirdly, we would want to be assured that fair equities would be set up among the property owners when the interests were pooled.

Taking these three principles in order, it is comparatively easy to convince experienced oil men that the operation of a pool as a unit and the consolidation of properties into larger units are both technically correct, but it is necessary to go a step further and convince them that the advantages are so great that it warrants letting the property pass out of his own hand into the management of others. When it comes to management, it is not only necessary that he be convinced that the proposed managers be competent, but that the machinery effecting consolidation be responsive to the stockholders' interests and that a minority stockholder will have a means of safeguarding his rights. Finally there is the most difficult problem of all—that of establishing equities.

It is of course obvious that there would be wide difference of opinion as to the values of properties and it is not only necessary that each interest concerned be convinced that a fair value has been established on his own property but that the properties of the other members of the proposed consolidation are not being overvalued. There is not only a question of the actual sales value of the properties at the time of consolidation, but of their potential values and even of the nuisance values.

Properties will not be operated in just the same manner after consolidation as before and therefore the elements of value may change; thus, in repressuring properties, the vacuum plants may be done away with, the gasoline plants either are converted into compressor plants or the machinery is discarded. There is also the question whether the gasoline plants after repressuring starts will be profitable and whether gas contracts should be given a value. These and many other questions enter into the problem of establishing equities in old properties.

In new properties there are such questions as the value of the properties on the crest of a structure which contains gas. Gassy properties, such as occurred in the Cromwell pool, might produce considerable oil under divided management, yet be

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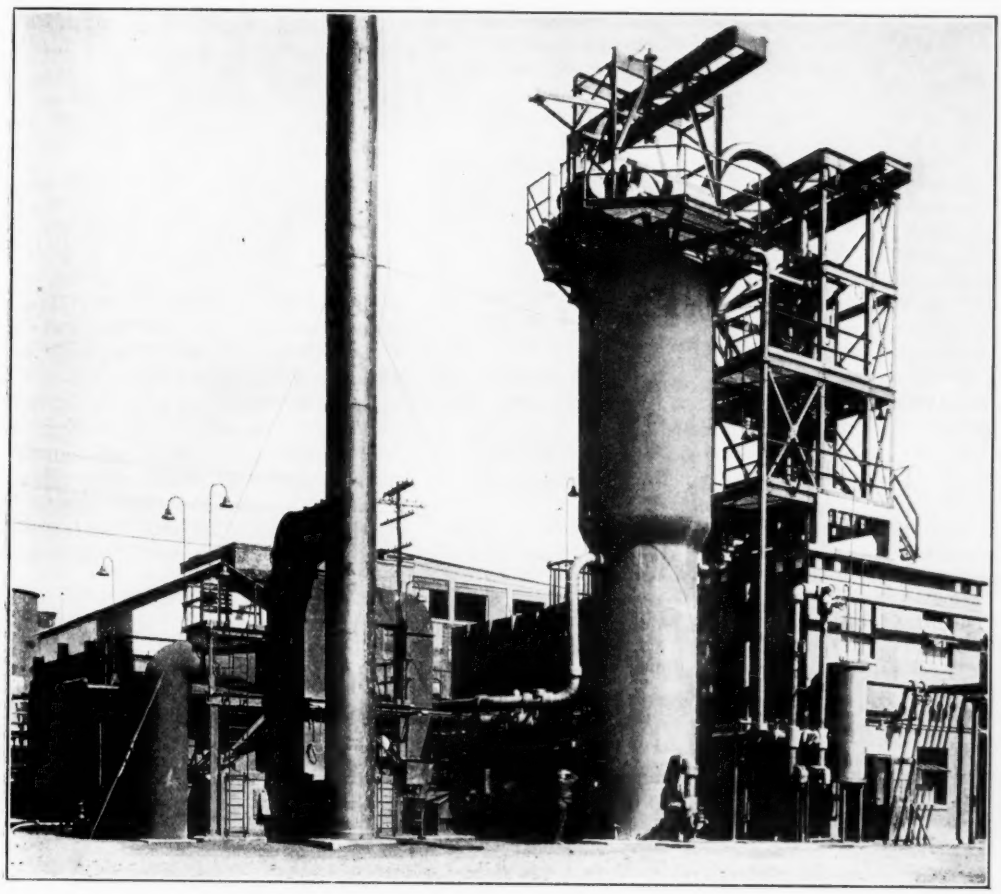

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destructive of far greater values on surrounding properties by blowing off the gas pressure and drawing oil into the gas sand. Under unit operation, this part of the pool would be shut in, it would produce less oil but would permit much greater recovery from the pool as a whole; thus, it is seen that such a property has a value; first, on the basis of what its operating profits might be under divided ownership; secondly, the nuisance value of the gas pressure which could be wasted; thirdly, gas pressure which could be conserved under operation; and fourthly, the value of the gas which could be saved and sold.

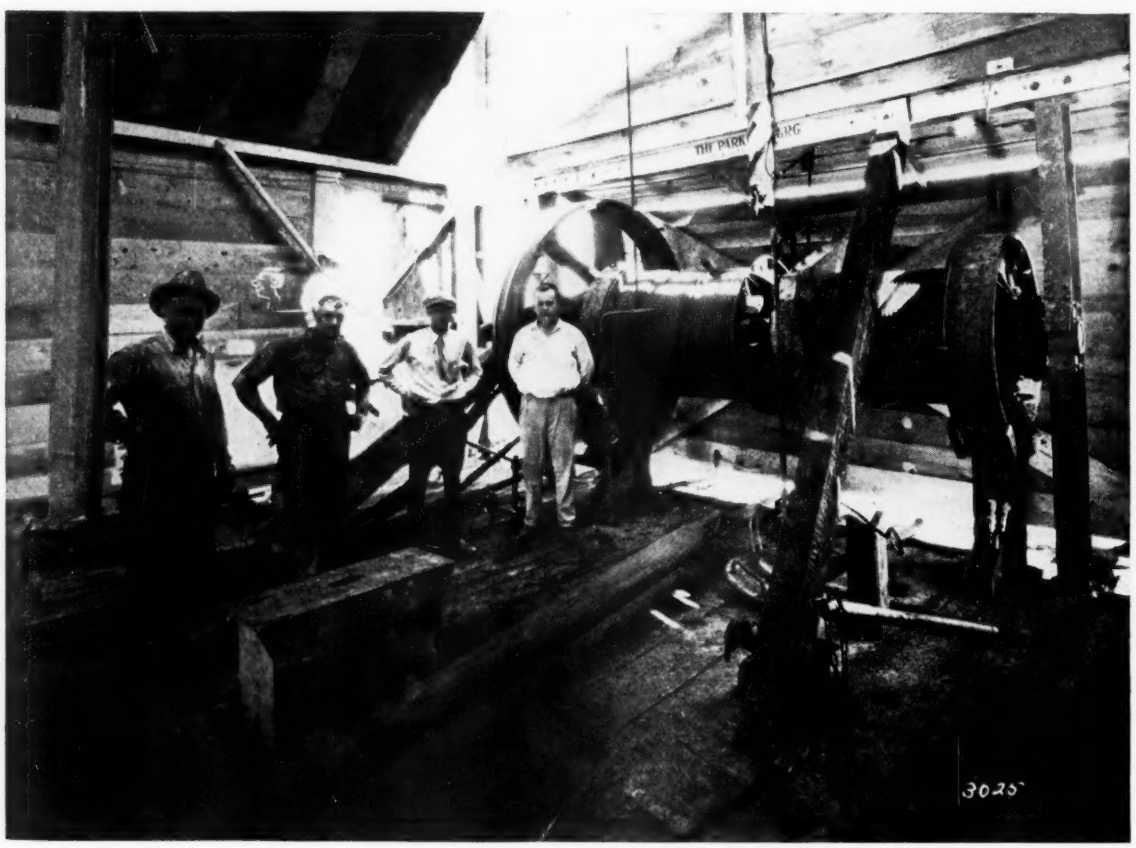
The adjustment of equities in a situation which seems to be so hopelessly complex points to three conclusions; first, that the establishing of equities must be approached with a spirit of give and take; second, that the method of establishing equities must be simple even though only approximate and must cut across the minor factors; third, that the property owners must be so convinced as to the desirability of effecting consolidation that they can enter into it in a state of mind to waive all but the major considerations.

The state of mind is all important and it is useless to discuss details of establishing equities until the property owners have become so desirous of consolidating that they will "cut the Gordian's knot" instead of trying to unravel it. If two parties are earnestly desirous of consummating an agreement, a way will usually be found, but if their desires are half hearted, minor difficulties then become insuperable.

For this reason the writers have deemed it more important that the oil industry become convinced of the desirability of unit operation than to set forth a detailed program applicable to all cases. In fact, no such general detailed program can be made out. Only guiding principles can be set forth and then the parties concerned must work out among themselves the details which satisfy themselves or what is most likely to be the solution, to appoint a board of appraisers who would have to be disinterested, competent and of unquestioned integrity.

The most difficult cases are the consolidation of fields in the flush stage of development. It is not so difficult to consolidate a block of leases in advance of the test well nor after the field has been drilled up and the worth of all parts fully disclosed. While admitting the difficulties of appraising properties in a flush pool, the writers believe this aspect has been greatly exaggerated for the flush stage is a transitory condition. If it were necessary, no attempt need be made to consolidate the flush pools for if in future all nearby leases were consolidated prior to each wildcat test, this problem would quickly solve itself; because, each new pool would be consolidated in advance of flush production and each of the present flush pools would soon reach the settled stage. The difficulties of consolidating flush pools have colored all opinion as to the practicability of consolidations yet this problem is comparatively of minor importance.

As a result of the writers' experiences they are now of the opinion that it will seldom be possible to get complete consolidation of a pool entirely by voluntary agreement, especially among royalty owners. If complete pooling is to be generally achieved, it will, in the writer's opinion, be necessary that some legal means be provided for a majority rule that, under proper safeguards, will enable a majority opinion in a pool to compel an obstructing minority to enter into the agreement just as is done in all our legal entities such as cities, corporations, etc.



More safety with the heavy loads necessary for deep drilling is the goal of manufacturers of drilling equipment. Here is shown the double braking bull wheel made by the Parkersburg Rig & Reel Co.

Developments in Refinery Technology in 1928

By E. W. Isom*

Read at American Petroleum Institute Meeting, Chicago, Dec. 3-6, 1928

THIS paper has been prepared because it seems proper that at the end of each year there should be a brief review of progress made, so that the industry generally can be informed on technical developments in the processing of crude petroleum and its constituents. * * *

The term "developments" as used here may refer either to entirely new methods, or to the better and more wide-spread use of known processes and equipment. At this session of the American Petroleum Institute there will be presented many papers giving details of various refining methods and of equipment, which are the result of various developments.

Hence, in this presentation there will be no attempt to go into any detail, but simply to present the broad features of developments, and such comments as seem to be pertinent at this time.

During the past year there has been no publication, nor has information been given out, concerning any major developments which can be classed as strictly new. There have been certain minor developments; one example of which is the use of an indirect heating medium in connection with the vacuum distillation of lubricating oils. In one development of this nature, diphenyl is used for the heating medium; and in another, mercury vapor. Until more is known of these methods of processing, their merit as compared with other methods cannot be determined.

The year 1928 is outstanding, however, for the rapid development and utilization of modern distillation and fractionating equipment, for both crude oil and cracking operations, by practically all refiners in order to meet present economic conditions in the industry. Refineries which were not equipped with efficient, low-operating-cost methods simply could not survive. The present development of various classes of equipment and methods of refining can be best shown by considering each under its own general heading.

I—Atmospheric Distillation

Practically all distillation equipment put into operation or installed in 1928 was of the pipe still class, using tubular heaters of various types and, in almost all cases, bubble towers for fractionation. Stills of this type have now reached the stage of development where they have been used or can be used on practically all the distillation problems to be handled by the refiner.

Their efficiency, based on utilization of fuel, has been brought up to 80 per cent, or even higher, equivalent to standard steam boiler performance. Fractionation has been developed to a point where large plant equipment will give the same yield and quality of products as elaborate and accurate laboratory analysis; this, of course, when stills of this class are used within their proper field.

Further development will be necessary to ascertain the division in the distillation field as between atmospheric distillation and vacuum distillation. In either case, pipe stills, by their economic performance, have demonstrated their supremacy for set conditions of operation.

Comparing modern pipe still distillation of Mid-Continent crude for production of gasoline, kerosene, and fuel oil with what was classed as good shell still practice only a few years back, we find that with one modern pipe still the refiner can produce finished distillates directly from the still in one operation, and do all the work with this still which was formerly done with a battery of crude stills and a battery of rerun stills. Stills of the modern type handling this class of operation will operate on 1 per cent, or even less, of fuel based on the charge. This compares with 4 per cent when using the shell stills plus rerun.

It is possible, however, to equip old shell still batteries so as to give efficiencies approaching those which can be secured with pipe stills. Shell still batteries, when equipped with bubble towers, air preheaters, properly insulated, and with heat exchangers and similar features which form part of the modern pipe still development, give a fair economic performance, and many refiners have felt justified in revising their old shell still batteries rather than abandon them and build pipe stills.

For handling certain types of distillation problems, special equipment for shell stills has been developed, for which is claimed an efficiency equal to or better than pipe stills.

II—Vacuum Distillation

The development in this type of distillation, which is practically all confined to the production of materials for lubricating oils from non-gasoline-bearing crudes or residuals from light crudes, or where oils have to be reduced or distilled under non-cracking conditions, has been toward the use of pipe stills as against shell stills, which up to this year have formed the only installations of this class in the country, only one commercial vacuum pipe still being known heretofore.

The rapid heating, short time factor, and low temperature distillation made possible by these stills result in a maximum production of viscous lubricating oils, as all conditions are such as to prevent any large degree of cracking or breaking-down of these oils into less valuable products. With stills of this type, the refiner can separate from low grade crudes lubricating oils of the cylinder stock class requiring very little subsequent treatment to make finished products, whereas before it was possible to secure such oils only from high grade or special crudes, or by preliminary acid treatment or equivalent refining of the lower grade crudes.

In many cases, however, the refiner does not find it necessary to secure the full possible yield of viscous lubricating oils from his raw materials, and in the handling of many oils the yields possible with pipe stills operating at atmospheric pressure compare very favorably with those from vacuum distillation. As vacuum stills are much more expensive per unit of product than are atmospheric stills, their use under all conditions is not economically justified. The proper division of this field is yet to be determined. A group session on this particular subject is to be held during the course of this present A.P.I. meeting.

(*Continued on Page* 80)

*Sinclair Refining Co.; chairman general committee on refinery technology, American Petroleum Institute.

III—Pressure Cracking Distillation

Stills for handling this type of distillation are now available to handle all classes of distillates and residuals for the production of gasoline. They can be operated at a wide range of temperatures and pressures. Their efficiency has been built up, particularly from the standpoint of fuel economy, to a point where less than 10 per cent fuel, based on gasoline produced, is required for their operation.

This can be compared with the first commercial pressure cracking still installations in this country of 25 to 30 per cent. Similarly, units have been increased in size to give a production of 2,000 barrels per day, or more, of gasoline; this to compare with the early shell still type of 40 barrels per day.

Practically all pressure stills being installed or in use today are of the tubular heater type, and, except possibly in some isolated instances, all shell type pressure stills in this country have been abandoned. The development of the pressure cracking still can be credited with the supplanting of shell stills by pipe stills for ordinary distillation, as the lesson learned on one showed the advantage to be gained from the other.

Further development in these stills can be expected, but the increase in economy of operation will be at a slower rate and less liable to cause the obsolescence of present modern units than has been the case in the past few years.

Developments now under way are leading toward the production of test distillates direct from the pressure stills, which will require only simple refinement to give a finished product; better instrumental control of operations; and, also, improvement in operating technique to give gasoline having a high order of anti-knock properties.

In this development, the pressure type of still is in competition with vapor phase cracking, which is the next subject we will consider.

IV—Vapor Phase Cracking

The year 1928 has witnessed the completion of many distillation units for production of gasoline by the vapor phase cracking method. By this method, a motor fuel having high anti-knock properties can be and is being produced. The by-products from this operation offer a large field for the investigation of the chemist.

From the gaseous by-products it is possible to secure various alcohols, such as iso-propyl, butyl, amyl, and ethyl alcohol, and other synthetic chemical products. With expansion of vapor phase cracking, it can be expected that a by-product industry will result. Various organizations are carrying on tests and development in this field at the present time.

Vapor phase cracking, as practiced under present day conditions, was initially made possible by the premium price that could be secured for high anti-knock motor fuel. Developments now under way in this field of cracking indicate that its technique may be improved so that gasoline may be made by this method as cheaply as by the pressure cracking method, and with the advantage of the feature of higher anti-knock value.

V—Finishing Treatments

The development of the pipe still, with its adjunct—an efficient fractionating tower, has eliminated a large proportion of rerunning previously necessary. Further, the character of the primary distillation is such that, even though the product may have the same distillation range as when made by the former methods, it does not contain the compounds which, in the older processes, it was necessary to remove by strong chemical treatment. * * *

With the use of the modern pipe still, whether under pressure, atmospheric, or vacuum distillation conditions, and with its companion development of efficient fractionation, the refiner has found that he has quite a different order of distillates to refine that those produced by his former methods. Where strong chemical treatment with acid and alkali was previously necessary, he is now able, in some cases, to make his finished product with a simple alkali wash, or even without any treatment.

In the case of certain products, he has found that the old-time strong chemical treatment removed certain desirable constituents from his product. This is particularly true in the case of gasoline produced by cracking methods, which, under strong treatment, would suffer reduction in anti-knock value due to removal of a portion of the hydrocarbons which give this quality.

In the case of lubricating oils, and with modern methods of distillation, some refiners have found it possible to eliminate acid treatment entirely. Having a different character of products to treat, there has been considerable development and stimulus to development of various treating methods. With a reduction in the undesirable ingredients which it is necessary to remove, milder forms of treatment can be utilized.

The year 1928 has witnessed a considerable expansion in the installation of treating methods using absorptive materials such as fuller's earth, or the specially prepared and more efficient earths having the same general properties. This extension of use has been almost entirely confined to fine mesh earths, insofar as liquid treatment is concerned.

There has also been a considerable expansion in the use of coarser mesh fuller's earth in the vapor phase treatment of gasoline. Both of the foregoing treatments are, in some cases, subsequent to treatment with sulfuric acid, but the general trend of development is to get away from the use of acid.

In the development of improved treating methods, the refiner has not forgotten his old friend, sulfuric acid. Considerable study has been given to methods of using this acid, and various plant developments have resulted. These include such procedure as refrigeration of the oil before and during treatment, limiting the time of contact of acid and oil, quick removal of the sludge from the oil being treated, and use of acid of various strengths.

In the treatment of lubricating oils, there has been considerable recent development in the use of liquid sulfur dioxide instead of sulfuric acid or similar treatment. Until comparatively recently, this method of treatment was limited almost entirely to finishing of kerosene and similar products. The field for this treatment has been enlarged, due to the comparatively lower grade lubricating distillates produced from many crude oils now being refined, and to improvement in the method itself.

VI—Chemical Products and Processing

It has been the view of many that eventually the chemist will be able to produce a line of synthetic products, using petroleum hydrocarbons as a base, corresponding in some degree to what has been done with the coal tar hydrocarbons. Petroleum hydrocarbons, however, do not lend themselves to chemical synthesis as readily as those from coal tar, and developments to date have been meagre.

During the past year there have been no developments of economic importance. At the present time only two plants, so far as is known, are producing products of this class on any commercial scale and from a

strictly oil base. One plant, which has been operating in a large way for several years, makes iso-propyl and other higher alcohols from refinery gases, which are in turn produced by cracking operations on petroleum hydrocarbons. The other plant makes an alcohol denaturant by an oxidation process on a petroleum distillate. * * *

In our affiliated industry—natural gas—there are several commercial developments in which chemical products are derived from hydrocarbons natural to the gases treated. To convert a petroleum hydrocarbon to a fixed gas corresponding to a natural gas, and which will contain various hydrocarbons, requires only a destructive cracking treatment. It is reasonable to expect that the future will bring considerable development in this field. * * *

VII—General

The subjects already considered cover the major features of processing used in the refining of crude petroleum. The improvements in these processes have been materially aided by the coincident development of special instruments such as pyrometers, pressure recorders, flow meters, and similar devices, and with which it is possible, in some cases, to secure automatic control. In practically all refinery processing, maintenance of exact conditions for maximum efficiency and for maximum quality is essential. Instrumental development has made this possible.

The prevention of losses continues to receive the careful attention of the refiner. For refinery storage of gasoline and gasoline-bearing oils, the floating roof or similar type of tank has been almost universally adopted as a standard. Equipment for conservation of gases produced by methods of processing, or escaping from storage tanks, is now classed as standard in modern refineries.

All this development and methods of conservation have made possible refineries which, for example, when processing Mid-Continent crude for a 65 per cent total gasoline yield, will have an operating cost of only a few cents higher per barrel of crude run than what was considered, only a few years ago, as being proper cost for what was then called an efficient type of skimming plant, and which could not secure greater than 30 per cent gasoline from the same crude. This is possible even after paying royalties on such patented processes as may be used. Similarly, the modern plant making a full line of products, including lubricating oils, will have an operating cost, in many cases, of less than one-half that of the so-called complete refinery of a few years back.

The development of new methods of processing and new types of equipment has resulted in and been accompanied by a material change in the relations between the technical personnel of the many organizations in the industry. As has been shown, refinery development has been along highly specialized technical lines. The outgrowth of this has been the creation and development of various engineering and engineering contracting organizations.

Even large refining companies no longer attempt to design or build entirely for themselves. In some cases these organizations sell their equipment on a royalty basis, under contracts requiring the user to disclose all improvements. In practically all cases the seller is in close contact with the user, and learns of improvements made or required to meet changed conditions. The result is that the old conditions, in which each refinery had what was the equivalent of a high board fence around it in order to prevent ideas from getting out (and which acted equally to prevent ideas from getting in), have been broken down.

The engineering contracting organizations are the clearing houses for a large portion of the ideas covering technical advancement. * * *

This exchange and disclosure of new ideas, with the resultant development of still further ideas, is fundamental to the spirit of industrial progress. This cause has been further aided, and possibly to a greater degree, by the presentation and discussion of various matters bearing on refinery technology at forums provided by the scientific societies with which the technical men of the industry are affiliated, and at forums of the oil industry itself.

The technical workers in the industry are increasing rapidly, both in number and in percentage of total employed. To care for them, additional facilities for technical meetings are indicated as being required, and these are offered by various scientific societies. It is believed, however, that the greatest benefit to the oil industry would come through an expansion of its own facilities for handling this subject. That this is needed is shown by a perusal of the program covering the various sessions of this meeting.

Many companies and organizations whose men have been active in previous meetings are not participating, or only in a more limited way, and this is due not to lack of contributions from them, but to the impossibility of handling all the papers offered in the time available. In the program for this meeting, preference was given those who had been less active in the past.

Any discussion of developments would be incomplete without considering what has been done toward the better refining of high-sulfur crudes, and their handling without destruction of equipment. There will be various papers on this subject presented at this meeting. There is probably more research and experimental work being done in this field at the present time than on any other of the problems being considered by the petroleum refiner. The problem has not yet been solved as to how to handle efficiently the high-sulfur crudes, and will not be solved until any of these crudes can be completely and economically processed to give full yields of valuable products corresponding to those possible from non-sulfur-bearing, or sweet crudes. * * *

Future Developments

Having presented the general features of development to date, some time can now be devoted to the course to be taken by future developments. It is idle, of course, to speculate on what may be developed in the future. For example, chemical methods for the treatment of petroleum may be discovered which would revolutionize the whole present system of refining. Primary research work, such as is being conducted under the auspices of the A. P. I., can be expected to provide the basis for some future development.

There is no present indication, though, of any development from these sources. There are, however, certain current problems in the industry which can be solved only by development work, and all of the existing methods of processing are capable of some further degree of improvement.

It is indicated that current work being done in pipe still design will result in greater efficiency. It has been pointed out that this efficiency is already high. It can also be expected that there will be a mechanical development which will result in lower cost construction for the same capacities and efficiencies as with present day equipment.

The bulk of the work along this line at the present time is in the matter of heaters for the various types of pipe stills. The refining industry at the present time is benefited in its operations, although penalized in its earnings, by an overproduction of fuel oil. This is due largely to excessive production of high-sulfur-bearing crudes, and a lack of methods to completely refine these crudes. * * *

Many pipe still furnaces of the present type are adapted for use only with gas or oil fuel. When economic conditions no longer warrant the use of oil for fuel, coal will be substituted, and refiners in the sections of the country where it is expected this change will be first required are an-

UNCONTROLLED LOSSES

UNCONTROLLED losses such as shown above are obvious. However, there are many others, not so spectacular, which likewise cost money... such as too great a loss in the making of definite specification gasoline. And, these latter named losses are *controlled* by Southwestern Rectifying Units. They produce the *greatest* quantity of definite specification gasoline in any given case... a fact that's been proven... time and again.

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ticipating the future by the development of coal burning furnaces for their pipe stills. Studies are being made of the use of powdered fuel and producer gas methods of burning coal, coincident with heater development.

Present day materials for use in high pressure and high temperature stills and for the handling of high-sulfur oils do not meet all requirements of the present, let alone the probable need of the future. The refinery technologist, in order to make possible the solution of his own problems, will require the cooperation of the metallurgist.

The new type of distillates made available by pipe still methods can be expected to result in considerable development in improved types and qualities of lubricating oils. During the past few years the refiners generally have given the major portions of the time of their technical staffs to improvements in gasoline and its manufacture. This field, while still offering many problems warranting further study, is probably less attractive as to possibilities of technical development than that of lubricating oils. For example, the rapid increase and advancement in aviation requires an increasing supply of very low pour test oils. With larger production, improvements in such known methods of dewaxing as centrifuging can be expected, and new methods may be developed.

The major problem, however, requiring development, to which attention has already been called, is the complete processing of high-sulfur crudes.

Many of the conclusions given in this presentation may be open to question. The writer hopes they will be questioned in a constructive way, as he will feel fully rewarded if there has been a stimulation of thought on the subject of developments in refinery technology. The statements made are believed to be based on the weight of the evidence, and are not entirely the author's own.

This paper has not attempted to discuss technical detail, but rather to show the broad trend of technical development. In this development are cooperating men whose primary training was in chemical, mechanical, electrical, and other engineering branches, but who are now, by their experience and knowledge gained and applied, properly called refinery technologists. They will solve the problems of the present and future as they have those of the past.

Cooperation of the country's industries has been asked by the Daniel Guggenheim Fund for the Promotion of Aeronautics, Inc., New York. It asks that names of towns and cities be marked on roofs of buildings, a service already undertaken by many oil companies.

Results of Application of Pipe Stills To Vacuum Distillation

By A. E. Harnsberger*

Read at American Petroleum Institute Meeting, Chicago, Dec. 3-6, 1928

A PIPE still to work under vacuum was designed on the increasing area principle to provide for the vapor as generated. The liquid-vapor mixture leaving the still at high velocity presents a difficult problem, inasmuch as the separating and fractionating equipment must be as nearly frictionless as possible to the flow of the vapors. Friction has been reduced in this case to less than 2.5 millimeters of mercury under maximum throughput.

The fraction from the bottom of the tower has cylinder stock specifications and, after treating with 5 pounds of acid and contacting with 10 pounds of clay to the barrel and dewaxing, it produces a bright stock of 7 N. P. A. color. Comparison of yields of neutrals and bright stock from Seminole crude distilled at atmospheric pressure and under vacuum shows 3 per cent neutrals and 9.10 per cent stock for the former method and 6.88 per cent neutrals and 10.59 per cent stock for the latter.

THE pipe still is recognized as one of the most economical distillation units and under proper conditions will produce oils of equal quality and yield with the less modern shell type still operating also at above atmospheric pressure. In either of the above mentioned types of equipment there is a limit to operating temperatures which would produce satisfactory heavy lubricating oil fractions by straight distillation.

The pipe still, particularly when operating at pressures above atmospheric cannot produce overhead cuts of high viscosity unless oil outlet temperature is raised to a point above that at which partial cracking takes place, resulting in a decreased yield of high viscosity fractions, these fractions having a poor color which results in expensive treating and filtering. Such high temperature operation generally results in decreased time on stream due to coke deposits in tubes and evaporator.

The advantages of batch stills operating under high vacuum are well known. They produce overhead products that are superior to those produced by the conventional shell still not using vacuum. However, since they employ fractional distillation, the partial pressure effect of the lighter fractions are lost as the distillation proceeds, resulting in higher distillation temperatures. In commercial sizes they also operate with a considerable hydrostatic head of fluid next to the heating surface, which makes the vacuum less effective.

Therefore, the next development has been to apply the pipe heater to vacuum stills, using modified fractional condensing equipment designed to produce as many different viscosity cuts as wanted. It is well known, however, that pipe stills, utilizing the same cross sectional area for oil and vapor flow throughout the entire length of heating elements, operate at high pump pressures on the inlet side because of the very high frictional resistance set up by the volume of vapor generated as the outlet end of the still is reached. Even if a vacuum is carried on the outlet end it cannot penetrate into the tube bank and be effective unless special provisions are made.

As a result of this back pressure, the heavier fractions of the oil are not vaporized unless excessive temperatures are maintained in order that sufficient heat of the liquid is available to supply the necessary latent heat of vaporization when the vacuum zone is reached. Some stills of this type have been designed with direct fired evaporators and other external sources of heat in order to make up the deficiency. However, in most cases of this kind, the static head of the fluid in the heated chamber in part at least defeats the purpose and the operation reverts to that of the shell type unit.

In order to obtain the maximum possible benefit of vacuum distillation and to eliminate as many as possible of the objections referred to above, a pipe heater was designed on the increasing area principle. The increase in area provides for the vapor volume as generated so that the frictional resistance of the flow can be reduced to a point where a high vacuum carried on the outlet end of the still can penetrate far back into the heating element and thereby effect more complete vaporization in the tubes than obtained in other types of pipe heaters. This increase in area can be effected by increasing the number of parallel streams flowing through the heater using the same size tubes throughout or by using one stream and stepping up at intervals the size of the tubes. The latter method presents the least amount of construction and operating difficulties. In very large units the combination of parallel streams of increasing area becomes necessary in order to eliminate the use of too large tubes in the final passes of the still.

Figure 1, shows a cross sectional view of such a pipe heater. The tube bank is divided into two parts, a preheating and a final heating section. The preheater consists of a group of comparatively small tubes carrying the vacuum still charging stock at a fairly high velocity in a counter current direction to the flue gases. From the preheater the oil flows upward to the high temperature zone where the tubes are exposed to the full radiant heat of the furnace. Since the oil entering this section is from 200 to 300 degrees below the outlet temperature it can absorb the high rate of heat input without danger of local overheating. At a calculated point where appreciable vaporization takes place, the size of the tubes is increased.

It is also necessary that as the temperature of the oil reaches within 100 degrees of the final temperature, a transition from above atmospheric pressure to a vacuum be made to assist in the vaporizing of the oil. As the vaporization proceeds the velocity of the oil-vapor mixture increases rapidly, due not only to the space occupied by the vapors but also to their expansion as the high vacuum zones are reached. Increasing the tube area by no means maintains a constant oil velocity. This is hardly possible or desirable. It only serves to reduce the frictional resistance to within the 14-pound limit allowable.

As the oil approaches the outlet temperature wanted, local overheating must be guarded against. In the heater shown, parallel flow of oil and flue gases is provided which greatly

*Mechanical Engineer, Pure Oil Co.

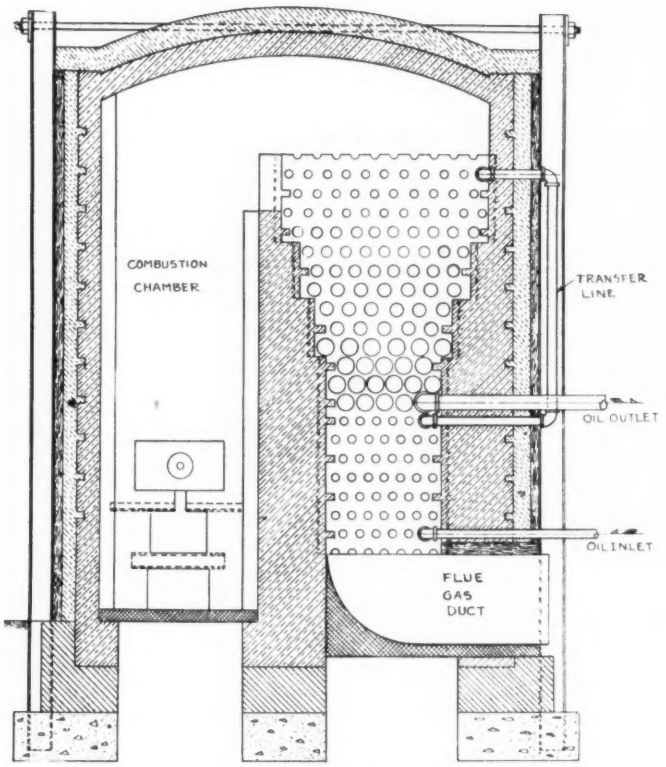


Fig. 1—A vacuum pipe still

reduces the chances of damaging the oil. This is apparent when it is considered that in the top row of tubes heat transfers of 15,000 to 20,000 B.t.u. per square foot may be expected but this rapidly reduces in the other rows until at the outlet the transfer rate is less than a 1000 B.t.u. per square foot. This low rate of heat transfer together with a high liquid and vapor velocity on the inside of the tubes, produces a uniformly heated mixture with freedom from cracking.

The ratio of areas of the different sections of the vacuum tube bank depends upon the conditions to be met. The frictional resistance is a function of the length of travel, the type and number of return bends and the tube area. In turn these parts are determined by the number of square feet of heating surface desired. The latter is governed by the throughput, inlet and outlet temperature and per cent vaporization of a given charging stock. Therefore, there can be no set rule to follow as to the relationship of cross sectional area of the vacuum tube bank.

The liquid-vapor mixture leaving the heater at high velocity presents a difficult problem of separation. This problem is made more difficult by the fact that the separating and fractionating equipment must be as near frictionless to the flow of vapors as possible. This problem of separation and fractionation has been successfully worked out by our distillation department. Friction has been reduced to less than 2.5 millimeters of mercury under maximum throughput and it may be practical to make an even further reduction. Figure 2 shows an outline sketch of the complete distillation unit and average results obtained on one type of charging stock.

The fraction from the bottom of the tower has cylinder stock specifications and after treating with 5 pounds of acid, contacting with 10 pounds of clay and dewaxing produced a bright stock of 7 N.P.A. color. That the fractionating tower gives good results is shown by the following method which was used as standard of fractioning efficiency. The tests of the first 5 per cent over by laboratory vacuum distillation of the bottom of the tower were compared to those of the bottom 5 per cent of the tower overhead. The flash, fire and viscosity of the overhead fraction were consistently the lowest. It is thought that this is practical means of determining lubricating oil fractionating efficiency.

Below is given a comparison of yields of lubricating oils from Seminole crude obtained by atmospheric shell still and vacuum pipe still distillation.

	Atmospheric pressure	Vacuum
100 Vis neutral from crude, per cent	1.25	2.68
200 Vis neutral from crude, per cent	1.75	4.20
Total neutral yield, per cent	3.00	6.88
Olive green stock from crude, per cent	9.10	10.59
Flash, degrees Fahr	525	525
Fire, degrees Fahr.	600	590
Vis at 210, Sec.	150	134
Lbs. acid per Bbl. to treat olive green color	56	None
Bright stock from crude, per cent	4.76	7.15
Pour, degrees Fahr.	25	30
Flash, degrees Fahr.	530	530
Fire, degrees Fahr.	600	595
Viscosity, Sec.	160	140
Color	7	7
Pounds acid per bbl. to treat from olive green	None	6
Filter yield from one ton No. 1 clay, barrels	17.0	39.1

When distilling Pennsylvania crude a series of high flash and fire oils can be obtained as overhead fractions having a lower viscosity than usual. For instance—an overhead product showing the following specifications was made representing a yield of 17.5 per cent of the crude.

Flash (open cup)	480
Fire	545
Vis at 210 Deg.	69
Color 60/40 Blend	5
Gravity be Deg.	28.9

Percolation filtering of this oil showed a yield of 29.4 barrels per ton of No. 1 clay.

After removing the naphtha content the oil showed the following specifications:

Flash	500
Fire	560
Gravity	29.8
Vis at 210	69
Color	4½ N.P.A.

This oil was further reduced in the pipe still under vacuum at 600 degrees outlet temperature into the following cuts:

Bottom of Evaporator:	
Flash	650
Fire	625
Vis at 210	92
Gravity	28.7
Color	5½ N.P.A.
Bottom of Tower:	
Flash	450
Fire	520
Vis at 210	50
Vis at 100	225
Gravity	32.0
Color	4½ N.P.A.
Overhead of Tower:	
Flash	385
Fire	450
Vis at 100	142
Gravity	32.6
Color	2 N.P.A.

Proof that the distillation was not of a destructive nature is shown by the fact that when the above three fractions were blended back on the basis of the same per cent that they were produced, the blend showed the following specifications:

Flash	490
Fire	555
Vis at 210	68
Gravity	29.8
Color	4½

It is to be noted that the original charge and the blend have practically the same viscosity and color showing that the distillation was not of a destructive nature.

The still is also well adapted to reduce dewaxed long residuum to bright stock, taking overhead finished neutrals the viscosity of which can be controlled by the tower operation. Pressed oil also can be reduced to a viscous bottom with very good results.

The amount of vacuum to carry is a subject for further study. The

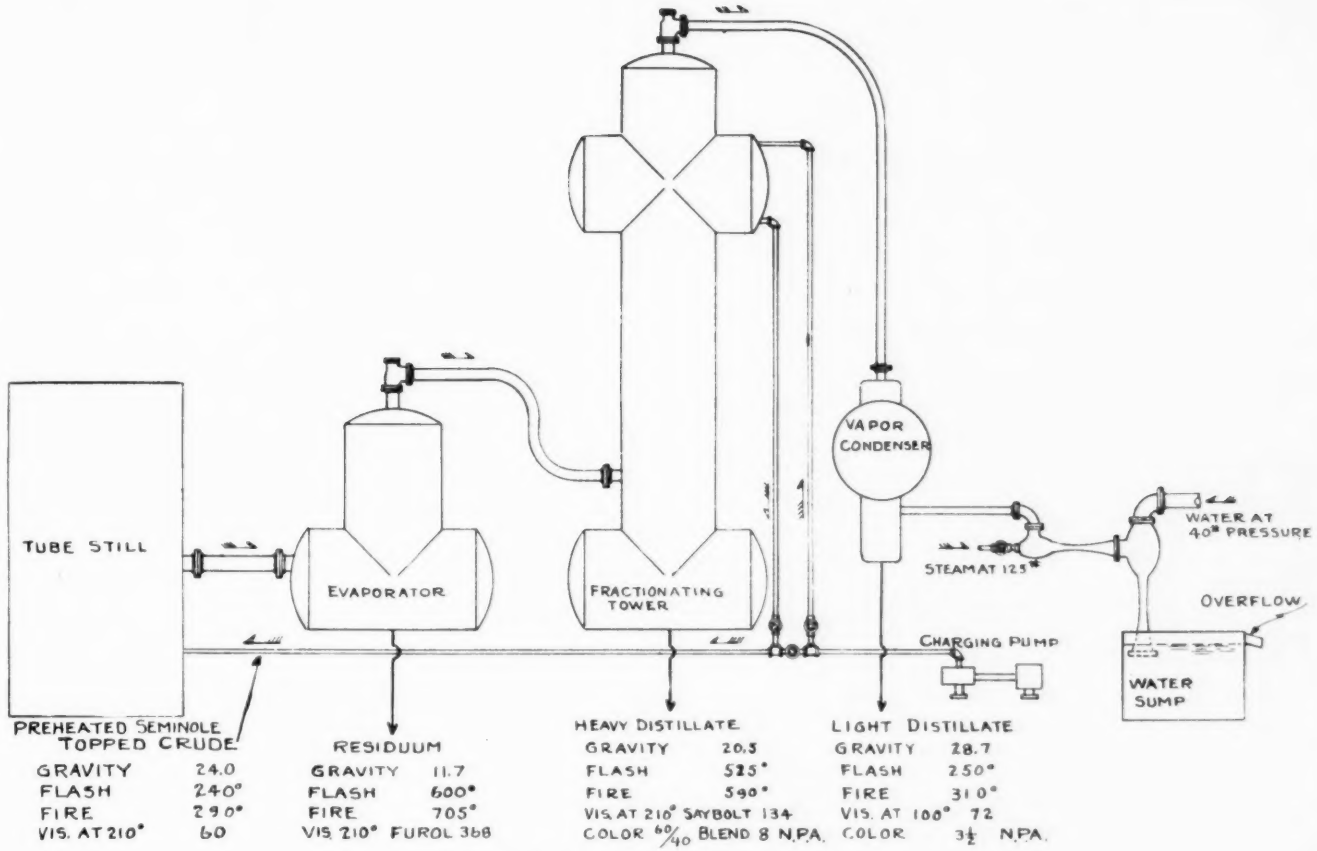


Fig. 2—Flow diagram of vacuum pipe still

hydrosteam jet vacuum pump used produces 6 millimeters absolute. The work has been carried on at a widely varying range of vacuum with and without steam. Lowering the vacuum from 6 millimeters to 30 millimeters absolute by the introduction of small amounts of highly superheated steam into the evaporator maintains the same gravity bottoms at the same furnace outlet temperature and by decreasing the vapor velocity results in a slight increase in fractionating efficiency.

The various cuts having viscosity below 100 seconds Saybolt at 210 degrees can be removed by either direct acting steam pumps or centrifugal pumps provided with recirculating and priming connections. At least a four foot static head on suction is needed.

Fractions above this viscosity were handled with vacuum traps and run-down tanks carried at a vacuum of 60 millimeters absolute by means of a single stage steam jet. Static head serves to overcome the difference in vacuum between the run down tanks and still.

As refining units, vacuum stills are undoubtedly going to become more popular with refiners. Especially pipe still units should have a wide application since operating as they do on a continuous basis maximum efficiency and low maintenance results. In their present stage no great amount of difficulty attends their operation. Improvements in their mechanical design coupled with the efficiency of welding makes it possible to carry high vacuum with low cost for vacuum producing equipment and its operation.

Fire Hazard in Flying Not Great

CLEVELAND, Nov. 30

Statistics purporting to prove that fire hazard is no more serious a menace in transportation of mail by airplane than it is by rail or steamship, have been sent out by Acting Postmaster General W. Irving Glover, who brands much of the recent talk of fire hazard to propaganda. The propaganda, Mr. Glover believes, is due largely to the unusual amount of publicity given to Pilot Hopson's crash in Pennsylvania Oct. 17, when his plane was destroyed by fire. Hopson was carrying a large shipment of diamonds and the attendant publicity was due largely to the difficulty of recovering these gems from early visitors at the scene of the wreck, Mr. Glover points out.

Among the more recent additions to air mail routes are Fond du Lac, Oshkosh, Appleton and Green Bay, Wis., which will be served by Northwest Airways, Inc., of Minneapolis, beginning Dec. 15. The service will be extended to these cities from Minneapolis to Green Bay.

Petroleum Accountants Organize in Tulsa

TULSA, Nov. 30.—The development, improvement, extension and standardization of petroleum accounting is the aim of the newly organized Petroleum Accountants Society. The society was organized on Nov. 22 at the Mayo Hotel, Tulsa, and has been incorporated under the laws of Oklahoma.

Membership will be limited to men over 21 years of age who are living in the Mid-Continent area and who are actively engaged as accounting officers, providing their duties in whole or in part include executive supervision of the accounting work of an oil company, according to D. B. Catterlin, auditor and assistant secretary of the Gypsy Oil Co., Tulsa, who was appointed temporary secretary of the society.

A membership committee was appointed at the first meeting which consists of all members of the Mid-Continent regional committee of the American Petroleum Institute's Committee on Uniform Methods of Oil Accounting.

The first regular meeting of the charter members will be held at the Mayo Hotel, Dec. 13, at which time a board of directors will be elected.

Single Pass Pipe Still Handles 2500 Bbls. Of Pennsylvania Crude Daily

By A. C. Vobach*

Read at American Petroleum Institute Meeting, Chicago, Dec. 3-6, 1928

THE comparatively recent general adoption of the pipe still unit for handling various distillation problems of the oil industry has given the eastern refiner an opportunity to adapt this type of equipment to the distillation of paraffin base crude in the production of lubricating stock.

It is true that on Mid-Continent oils and asphaltic base crudes pipe still development has been carried the furthest, but in both of these applications with the present over-abundant crude supply the desirability of running with minimum cracking action has not been so urgent.

On Pennsylvania crude, where the bottoms product must meet strict specifications in regard to tar content, and where the original cost of the crude is so high that the refiner must secure the maximum possible amount of viscous lubricating oil in order to get the greatest value out of the product, it is very essential that the refining operation be conducted without cracking.

This was formerly more or less successfully accomplished on the old batch shell stills at the expense of rerun of most of the overhead cuts, which were usually poorly fractionated, and by the aid of 100 or more pounds of steam per barrel of crude run.

With the application of the pipe still and coincident development of efficient fractionating towers, it has been found possible to take a gasoline, combined kerosene and fuel oil, paraffin distillate, and cylinder stock, from a single tower at the outlet of a pipe still; each stock well fractionated and with the utilization of less than 25 pounds of steam per barrel of crude processed, and decreased fuel consumption.

Further, for a given required production the pipe still unit is materially cheaper than either continuous or batch shell type stills.

Material made on pipe still operations lends itself readily to further treatment since it has been exposed to heat for only a very short period and the velocity while heat is applied is so great that good heat distribution takes place and superheating of the oil film next the heating surface does not occur.

It is the purpose of this paper to give a description of the construction and operation of a 2,500-barrel per day unit making the above cuts, and to bring out for discussion such points as will aid in the development of this type of still to an even higher state of perfection.

THE pipe still and accompanying suitable efficient fractionating towers have made it possible to process Pennsylvania crude and to take a gasoline cut, a combined kerosene and fuel oil cut, a paraffin distillate cut and cylinder stock from a single tower at the outlet of a pipe still, each stock well fractioned, and all with the utilization of less than 25 pounds of steam per barrel (the old shell stills often used 100 pounds of steam to the barrel) and decreased fuel consumption.

Material made in the pipe still lends itself readily to further treatment since it has been exposed to heat for only a very short period and the velocity while heat is applied is so great that good heat distribution takes place and superheating of the oil film next the heating surface does not occur. No cracking takes place.

Equipment

The oil heater is of well-known manufacture and has outside dimensions 22 feet 6 inches long by 2 feet 0 inches wide by 26 feet high above foundation. Furnace is 12 by 18 by 22 feet 6 inches high with an air cooled bridge-wall 3 feet thick by 18 feet high.

Running longitudinally below the roof are 56 four-inch six-gauge bare radiant heat tubes, each 18 feet long in the heating zone. Behind the bridge-wall in the convection bank are two sets of tubes. The lower contains 36 four-inch six-gauge tubes covered with 4-inch by 6⅝-inch ringed castings for heat absorption. These are arranged in nine vertical rows, four tubes to the row, with an effective length of 18 feet per tube. The upper set of tubes contains 16, with four rows of four each, same length as the others. The two upper rows are covered with 4 by 5½-inch corrugated rings, the two lower having finned rings similar to the lower 36 tubes.

Between the two sets of convection tubes is the steam superheater, consisting of twenty 2-inch nine-gauge tubes 18 feet long, covered with 2 by 4⅝-inch rings. All tubes have ¾-inch cores and each five tubes in a row are in parallel, with headers at the ends.

The crude flow enters the lower bank of 36 tubes, passes through an outside line around the superheater into the upper 16 convection tubes, then into the lower row of roof tubes and finally through the upper 28 roof tubes into the fractionating tower.

Total length of oil heater is roughly 2,050 feet, including return bends, and the oil remains in the heater a maximum of 15 minutes if no vaporization in the heater is assumed. With partial vaporization as undoubtedly occurs in this heater, we can safely say that the oil is under temperature probably 8 to 10 minutes or less, and reaches a velocity at the point of greatest heat application of possibly 250 feet per second.

Instrument board mounted on side of heater shows temperature of furnace gas above convection bank on right and left sides, temperature of flue gas leaving tubes, CO_2 in waste gas, drafts, pressure of oil into and out of heater, and temperature of oil into and out of heater.

Fuel used can be either oil or powdered coal; very uniform operation can be maintained with fuel oil. While some trouble has been experienced with ash disposal on powdered coal installation, there is every reason to believe that ultimately powdered coal will be used, with oil burners for standby service and for use in starting up the still when cold.

Cleaning of the heater is necessary about every six to eight weeks, this depending upon the transfer temperature carried at the heater outlet and rate of deposition of solid matter from the crude. It has been found on this unit that when an 800 degrees Fahr. or higher transfer temperature is used, some cracking and coke deposition occurs, also that the deposit is slightly greater at the bottom of the tube where the greatest heat application occurs, this being in the lower row of roof tubes which are closer to the direct flame and have more of the

*Sinclair Refining Co.

oil in liquid phase due to the higher pressure and lower temperature. These show a slightly greater amount of coke than the upper row.

All tubes are rolled into return bend headers, the roof tubes having patented return flow headers for cutting down the pressure drop. Cleanout plugs are the locking type for quick removal and replacement.

Convection tubes all have the box type of return headers with screw plugs. After a year of operation cleaning of all of the convection tubes was not found necessary and need for cleaning any of them was not imperative. Ordinarily, down time for cleaning tubes should not consume over 24 hours; usually, however, on this unit, due to making pipe changes or repairs and trouble in removing plugs in the roof tubes, several days were required.

Taper of the plugs was not enough to allow breaking out easily after the mixture of sealing oil and graphite had coked together under high temperature.

Leaking plugs were never a source of trouble, partly because each time after cleaning and replacing plugs the heater was pumped full of oil and pressure test (cold) of about 175 pounds made before firing the still.

The fractionating tower is 6 feet 6 inches diameter by 76 feet high, ½-inch steel plate, butt strap riveted, and welded. It is equipped with 30 bubble trays and caps spaced on 20 or 24-inch centers and has internal stripping sections and side cut takeoff lines for removal of gas oil and paraffin cuts.

Off the bottom of the tower is a 6-inch line for removal of the residuum; the lower 4 feet of the tower is for accumulation of this cut and stripping of light ends with superheated steam discharged through a spider into the oil. Above this accumulator are four bubble trays in which most of the stripping is actually done by the steam blowing through the descending oil.

The 6-inch vapor or transfer line from the heater enters the tower above the fourth tray, dropping the heavy ends to be stripped onto the tray and the light fractions rising through two strip grid baffles and then through tray No. 5.

Trays 5, 6, 7, and 8 are for fractionating of the heavy ends of the rising vapors, and above tray 8 is a stripping section.

This section was originally intended for stripping and removal of paraffin cut, but it was found that in production of cylinder stock bottoms of 200 viscosity at 210 degrees Fahr. or higher, a wax slop cut of several per cent was necessarily taken off at this point to give both good paraffin and cylinder stock.

Still later it was developed that with higher transfer temperature and 100 per cent reflux around the wax slop stripping section it was possible to take off a good cylinder stock up to 200 viscosity at 210 degrees Fahr., but in either case it was necessary to take out the paraffin at a higher point in the tower.

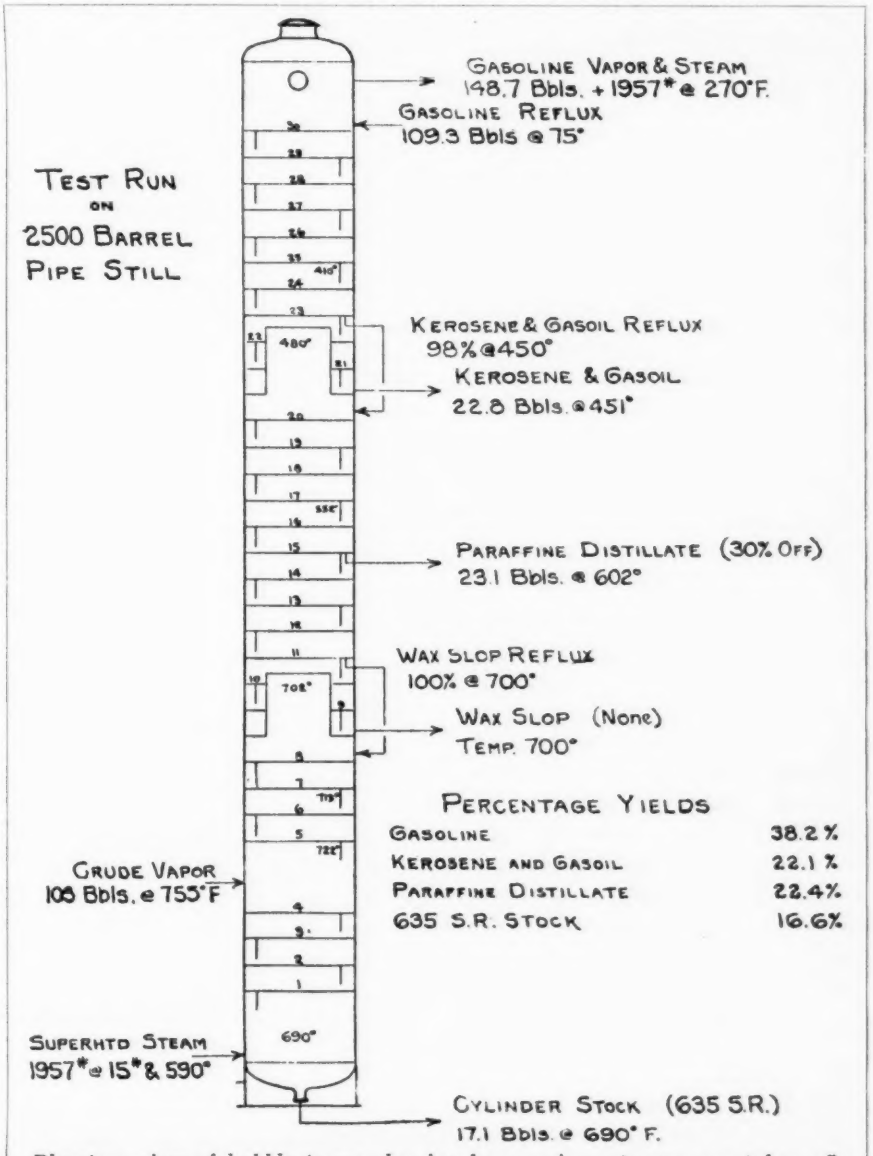
The internal stripping section as arranged above tray 8 consists in blocking off the tower except for a riser 36 by 42 by 48 inches high through which the vapors must pass. Trays 9 and 10 are stripping trays with vapor opening cut down 50 per cent by the riser extending through the center. On the bottom plate of this section is a stripping steam spider and from the side of the tower a 3-inch drawoff line for the stripped product. Gauge glass inside of tower indicates level and whether removal is being properly made.

Tray No. 11 is the first complete fractionating tray above No. 8 and the liquid reflux from this tray can be discharged onto tray No. 10 in any desired proportion by an outside controlled, internally acting, slide takeoff box. The function of this valve is to remove from tray No. 11 such part of the liquid as is desired to be used as reflux on tray No. 8 with the remainder going down to tray No. 10 for stripping and removal, or conversely, putting any desired amount on No. 10 for stripping and removal, with the remainder by-passing the stripping section and being used as hot reflux on tray No. 8.

With this arrangement it is necessary that other factors, namely, transfer temperature and reflux higher in the tower be properly adjusted to give the amount of liquid reflux from tray No. 11 for proper amount of reflux to No. 8 and proper quality takeoff from the section.

The reflux line from the takeoff box is 6 inches with a 6-foot loop below entrance on No. 8 tray for a seal to prevent vapors rising through the line and by-passing trays 9 and 10 outside the tower.

Nine trays occupy the space below the next stripping section and above tray No. 11. Off tray No. 15 is the paraffin line, through a graduated



Phantom view of bubble tower showing how various streams are taken off

valve similar to that in use on tray No. 11; however, in this case the stripping section has not been found necessary. The amount of paraffin cut removed is controlled by laboratory tests. For example, in case the gravity is too high and viscosity too low the slide valve is pulled out a little, which results in a smaller percentage and volume being taken off. Then by bringing up the transfer temperature slightly to overcome the effect of the increased reflux the unit is brought back to balance, now taking off a smaller yield of lower gravity and higher viscosity product.

If it had been found necessary because of low flash to install a stripping section this would have been done, but the flash has easily been kept at 300 degrees Fahr. or higher.

Above tray No. 20 is a stripping section similar to that above tray No. 8. Trays Nos. 21 and 22 are stripping trays similar to 9 and 10, and tray 23 is equipped with graduated valve similar to trays 11 and 15 with operation similar to that on No. 11.

Trays 24 to 30 inclusive are gasoline fractionating trays, the cold gasoline for tower head control being introduced directly on tray 30 through a 3-inch line from the reflux pump.

Above this point are three sets of strip grids and on opposite sides of the tower two 12-inch vapor lines.

This constitutes the principal construction of the tower; summarizing, there are four trays for stripping of bottoms below the vapor entry, four trays above for heavy oil fractionation, then the wax slop stripping section, and two stripping trays in same, above which are five trays and the paraffin takeoff tray. Five more trays are below the kerosene and gas oil stripping section, and above this are the final eight gasoline fractionating trays.

In starting up the tower when the side cuts are not of proper quality for removal, drainage lines are provided, teed into the takeoff lines and discharging to trays 6 and 18. These lines also are for removal of water which at the start would condense on the takeoff pans and possibly be vaporized suddenly when the temperature became high enough.

It might be interesting in passing this point, that while each time the tower has been started up most of the bubble trays were full of water, never has the slightest gurgling or thumping indicated that sudden vaporization of water was taking place. On the contrary, as the tower head came up to the boiling point of water, large volumes of water came off as evenly as could be desired, and the tower head remained at about 210 degrees Fahr. until all of the water had ceased to come off.

At the top of the tower as a safety release is installed a 6-inch weighted pressure relief valve set for about 4 pounds. A mercury manometer is set in the top of the tower also, indicating pressures of around 1½ pounds normally, this being due to drop through the vapor heat exchanger and lines.

Uniform end point overhead is made by control of direct reflux to top of tower through automatic electric controller and hand operated valve in parallel. This gives a head temperature which varies only a few degrees.

At the bottom of the tower a pressure manometer is installed for determination of pressure drop through the tower. This usually shows between 2½ and 3 pounds indicating a drop of 1½ pounds through the 30 bubble trays.

For constant control of bottoms level in the tower there is a float mechanism which regulates the flow of bottoms from the tower chamber.

Removal of cuts from the tower is accomplished in several ways. Bottoms are pumped, due to low head and high viscosity. The wax slop cut drops through the cooler box, rises in a vented line to almost the level of the takeoff, and then gravitates through the receiving house look-box to tankage.

Removal of paraffin cut and kerosene and gas oil cut is also made in this way, the compensating risers being provided to hold a liquid level in the takeoff lines almost back to the tower, preventing thereby siphoning and condensation of light vapors with the side products. This scheme works very nicely and flash tests on cuts show that no vapor loss is taking place.

The overhead gasoline fraction is run through the vapor heat exchanger and cooler by gravity, through the look-box, and out to tankage.

As auxiliary equipment, this still has one vapor heat exchanger followed by a water cooling section on the overhead line, and a liquid to liquid heat exchanger on the bottoms line.

The vapor exchanger easily cools the overhead stream to 80 degrees, but considerable trouble has been experienced with it due to its not being designed to operate at the high pressure found necessary.

The bottoms exchanger, as mentioned later, is not getting good heat exchange and has pulled some tubes by unequal expansion.

The crude supply is pumped from either of two supply tanks with an electric centrifugal pump. For standby, a steam pump is in the line, ready to be cut into service whenever necessary on account of power failure.

From these pumps the crude goes through a meter and then up through the vapor heat exchangers where a preheat of 230-240 degrees is obtained. From this set of exchangers it passes through the bottoms exchanger where the preheat is increased to 250 to 260 degrees and then into the heater.

The reason no other exchangers are in use on the side cuts is because this unit was originally designed to run for 40 per cent long residuum bottoms with side cuts of gas oil and kerosene; under such conditions a large amount of bottoms at high temperature would furnish considerable preheat to the crude. Under present conditions, making roughly 15 per cent bottoms, less heat is available and greater loss occurs by sensible heat in side cuts.

The pump house has two steam duplex pumps which pull the bottoms through the residuum exchanger and cooler and discharge out to stock tanks. Only one of these pumps is in use at a time, the other being kept ready in case a breakdown on the first necessitates its use.

The gasoline reflux pumps are also two in number, the first an electric driven centrifugal pump and the other a steam-driven duplex pump.

The value of having two pumps for each service lies in the fact that a breakdown on any pump does not necessarily require shutting down the still until repairs have been made, and allows all of the pumps to be kept in good operating condition at all times.

Also in the pump house is the manifold line for delivering exhaust steam from any steam pump in operation to the superheater, with a regulator and reducing valve in the plant high pressure steam line for supply of makeup steam. By this system, holding constant pressure on the superheater and uniform flow of superheated steam to the tower is possible, with complete recovery of exhaust steam from the pumps.

Outside the pumphouse, underneath the deck connecting tower and receiving house, are manifolds and crossover valves for switching pumps. Here also connection is made for pulling tower bottoms with steam crude pump and discharging back to crude tank or through heater again. This arrangement is used when still is started up, circulating the bottoms in the tower back through the heater until all water is off the tower and side cuts are started.

The receiving house is located over the pumphouse and contains the look-boxes and rundown lines on wax slop, paraffin distillate, kerosene and gas oil, and gasoline streams. The 3-inch reflux line passes up through the house and control of reflux either by hand valve or automatic controller is made here and resulting head temperature observed.

Gasoline tanks are used both for rundown and reflux feed. In practice the overhead is run into a tank until it is full, then the water is drawn off and the gasoline held for reflux, or if sufficient reflux is on hand in another tank this stock is transferred to the agitators.

Operation

Beginning with the unit shut down, say after cleaning tubes, the follow-

ing method is used in starting up:

1. Inspect whole unit to see that proper valves are open or closed, go over heater plugs, and line up for starting crude feed through exchangers and into heater.

2. Watch for leaks as heater is filled up and when oil starts to run out of heater into tower pinch down on outlet valve and build up test pressure. As soon as this test has shown that all high pressure equipment is in satisfactory condition, fill the bottom of the tower until about 2 inches shows in the gauge glass, close off the crude supply line, and open the bottoms line to circulate bottoms slowly through the heater.

3. Start slow fire in heater and bring up slowly to protect brickwork, watch oil outlet temperature. As level in tower drops due to vaporization of light ends, cut in small flow of fresh crude to hold same.

4. Cut back side cut lines and reflux loops to tower and drain water out of bleeders in bottom of loops. Keep these loops clear of water.

5. Start small amount of steam through superheater into bottom of tower as soon as oil temperature is up to 212 degrees. Also set graduated reflux valves at setting found by previous experience to be about right to make desired quality and volume of side cuts.

6. Watch top of tower temperature and rate water comes off. When temperature starts rising to 225 to 250 degrees, make another inspection of loops and draw off water. Start taking out side cuts, stop recirculation and start drawing bottoms to hold tower level, feed all fresh feed into heater. Start water through lower sections of vapor exchanger.

7. Increase superheated steam, raise transfer temperature to about 600 degrees Fahr., start feeding gasoline reflux when top of tower temperature is up to 275 degrees Fahr. and gradually bring still up to operating conditions.

8. Raise transfer temperature and feed rate to schedule. Check over all valves and lines to see that everything is running properly.

9. Start taking operating data, gravities, and tests on cuts. When flash and viscosity on bottoms are to test, cut into stock tanks.

Three men are used per shift to run this still, one stillman in charge who makes valve changes and watches entire operation of the unit, one fireman who takes data on the heater and regulates the fire, and one pump man who watches the bottoms level, steam pumps, draws water on rundown tanks, and helps out the stillman and fireman.

The necessity for the third man is due to the stillman making hourly flash tests on the still bottoms, and because the rate of bottoms drawoff using the level controller has varied beyond desired limits. While two men could probably operate the still with entire satisfaction, in the event of a pump breakdown at night or other trouble the presence of the third man might be very necessary.

Each morning, from the running cards to 7 a. m., a report of operations for the past 24 hours is made up covering such data as is necessary. A typical copy of this is as given below:

Bbl. crude throughput by meter	2528.0
Bbl. crude throughput per hour	105.3
Average gravity gasoline	59.9
Average gravity kerosene and gas oil	41.3
Average gravity paraffin distillate	33.6
Average gravity wax slop	—
Average gravity bottoms	25.0

Tests on Stocks

	Paraffin Distillate	600 S R Stock
Flash	315°	545 (P.M.-515)
Fire	400	625
Viscosity	84@100°	158@210°
Pour	75	30
Tar	....	.037%

Heater Operation

Furnace temperature, west side	1186° F.
Furnace temperature, east side	1183
Per cent Co_1	11.5%
Furnace draft	.02" H_2O
Pounds coal burned	30,350
Pounds coal per barrel crude throughput	12.0
Temperature oil entering heater	247° F.
Temperature oil leaving heater	710° F.
Pressure oil entering heater	104 lb.
Pressure oil leaving heater	10 lb.
Pressure steam entering superheater	25 lb.
Pressure steam leaving superheater	15 lb.
Temperature superheated steam	598° F.

Tower Operation

Wax slop reflux valve setting	100%
Kerosene and gas oil reflux valve setting	87%
Paraffin takeoff valve setting	29%
Pressure bottom of tower	2⅝ lb.
Pressure top of tower	1⅜ lb.
Temperature crude leaving vapor heat exchanger	228° F.
Temperature crude leaving bottoms exchanger	247° F.
Temperature bottoms in tower	664° F.
Temperature bottoms leaving exchanger	480° F.
Pressure crude entering vapor heat exchanger	130 lb.
Pressure crude entering bottoms exchanger	121 lb.
Temperature top of tower	270° F.
Average flash on bottoms (open cup)	545° F.

These results are indicative of operation when reducing to 600 steam refined stock, this being the lightest cylinder stock made. When orders require, by increasing the transfer temperature, the bottoms flash and viscosity can be raised to produce a 620 or 635 steam refined stock, and by taking off 4-5 per cent of wax slop and using about 780 degrees transfer temperature, a 590-degree flash, 232 viscosity, 650 steam refined stock is produced. It has not yet been found possible to remove 650 stock without taking out the wax slop cut. If this is not done the paraffin cut suffers by carrying with it a fraction of amorphous wax which may press but hinders sweating considerably. Otherwise the paraffin cut can be handled satisfactorily, especially when mixed with shell still rerun paraffin distillate.

Testing

During the greater part of the past year, since the start of operations, tests have been made on this unit to improve results.

Originally planned to run for 40 per cent long residuum bottoms, gas oil and kerosene side cuts, and gasoline overhead, in the absence of a dewaxing plant the still was started to take off a 30 per cent combined cylinder stock and wax distillate, gas oil and kerosene side cuts, and gasoline overhead. Still transfer temperature was carried at 600 degrees Fahr., the bottoms were mixed with crude and rerun on the shell stills for cylinder stock.

Gasoline yield was 40-41 per cent, but the kerosene yield only 4-6 per cent with a low gravity and close distillation range. The only way to secure a kerosene cut which would meet gravity and shipping specifications would be to take part of the heavy end of the gasoline cut and incorporate this in the kerosene.

The gas oil cut had a high initial and no content of viscous oil.

On reducing the bottoms in shell stills, due to the concentration of heavy ends it was found very difficult to get low tar content on 635 or 650 stock. 600 and 620 steam refined bottoms were about the heaviest which could be made successfully.

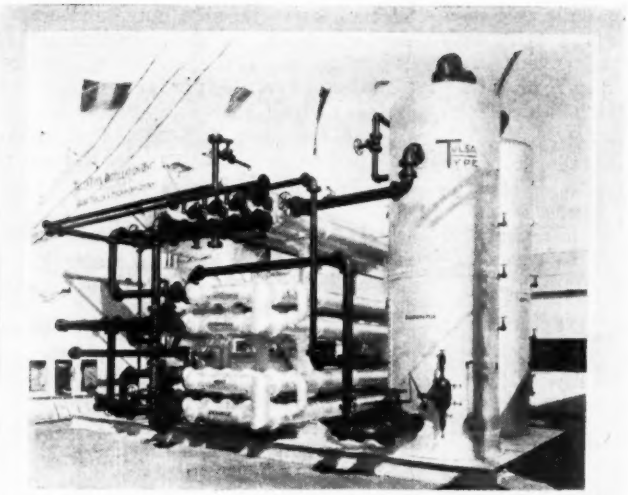
After several months of operation it was found that the overhead vapors were very corrosive toward the steel rundown lines and had eaten entirely through some of the nipples on the look-box manifold. Feeding strong liquid ammonia solution into the crude and testing overhead water with phenolphthalein was resorted to and successfully neutralized the overhead, but feeding such a small amount of ammonia through a needle valve could not be made uniform enough to give satisfaction. Recently, neutralization has not been made but all parts subject to corrosion have been replaced by cast iron.

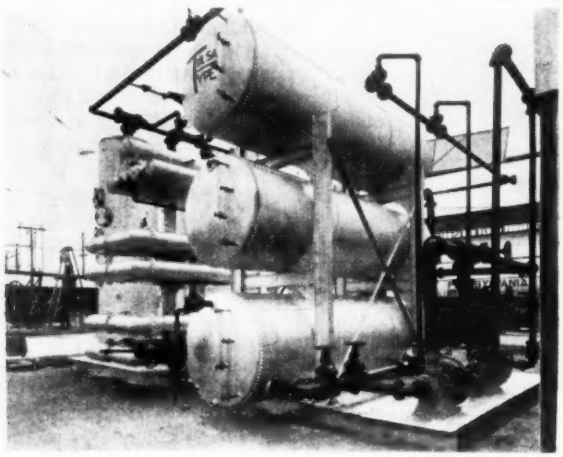
A point to remember in this type of corrosion is that it is due to hydrochloric acid from decomposition of chlorides and does not have any appreciable effect until after condensation of steam takes place. Then it cuts into steel rapidly along the bottom of lines, but leaves cast iron and malleable fittings apparently entirely unaffected.

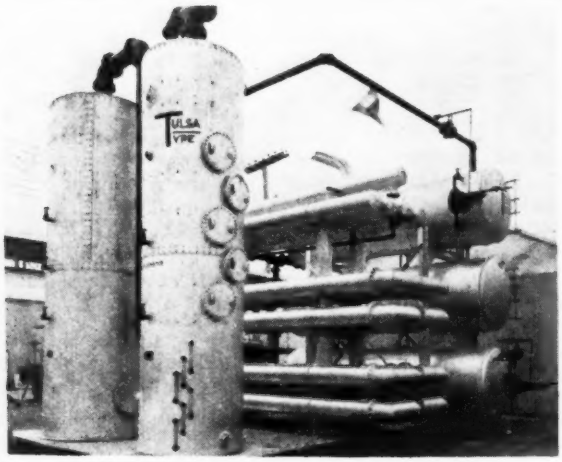
A further difficulty has been the formation of a sort of iron sulfide sludge in the tanks and reflux lines as a result of this corrosion. Several times when the reflux pump seemed unable to pump back a sufficient supply to the tower, it was found on breaking into the suction line at the pump that the opening in the pipe had been decreased to about 1 inch by the building up of this sludge in the line.

To decrease the pressure drop through the heater all of the return boxes on the roof tubes were changed. These had originally been the square box type with screwed plugs; they were changed to the return flow type with locking plugs, in which no turbulence or restriction should occur.

Data on runs before and after the







TULSA TYPE EQUIPMENT

FOR the benefit of those who were unable to attend the International Petroleum Exposition

-¦- -¦- We are showing herewith, three views of the largest, most complete, most up to date display of gasoline plant equipment ever shown at any exposition.

This Tulsa Type Distillation Unit comprises three carloads of material. All Tulsa Type Distillation Units are shop-tested completely set up as per the accompanying pictures.

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change in these headers is not quite comparative but indicates at least 15 per cent and possibly 20 per cent greater throughput capacity with the present headers.

The bottoms from the tower with the 600-degree transfer temperature, gave no indication from color or tar content that cracking occurred. To make flash and viscosity test cylinder stock direct from the still was a problem on which no information was available and which could only be proved operative by actual trial.

The transfer temperature was accordingly increased to 700 degrees Fahr. and samples off the bottom of the tower were 540 to 545-degree flash with a viscosity of about 200 seconds and very low tar content. The lower side cut ran a heavy paraffin distillate, and off the upper tray removal of a combined kerosene and gas oil was made. The amount of reflux required into the top of the tower was considerably increased to remove the greater amount of heat coming into the tower. Also, more superheated steam was put into the bottom of the tower for the purpose of driving off the light ends.

Operation in this manner was carried on for quite some time, running about 1,800 barrels per day, and making adjustments in the reflux valve settings to get better products. The paraffin cut continually ran too high in viscosity and contained some light ends of the cylinder stock fraction, while the bottoms were satisfactory in regard to flash but were also high in viscosity due to loss of the low viscosity ends in the wax cut.

The next change was in the addition of a paraffin line off No. 15 tray, the former paraffin takeoff now becoming a wax slop line. Operation with this new line immediately gave a good paraffin cut; however, 4-6 per cent wax slop of 30-degree gravity and high viscosity was taken off in order to give proper flash bottoms. Development further gave 600 steam refined bottoms in which the wax slop was refluxed entirely and none removed. Transfer temperature was raised somewhat and steam increased into the bottoms to allow this.

In connection with the use of superheated steam, it has been found that about 600 degrees is as high as the superheat temperature should be allowed to go to prevent cracking of the bottoms in the accumulator. For a considerable period, open cup flashes on cylinder stock were regularly held as desired, but on these same stocks Pensky-Marten flashes were too low. During this time superheated steam was used at 760 to 780 degrees but it was not thought that this would have any detrimental effect since any light vapor formed should be removed by the steam which caused the cracking.

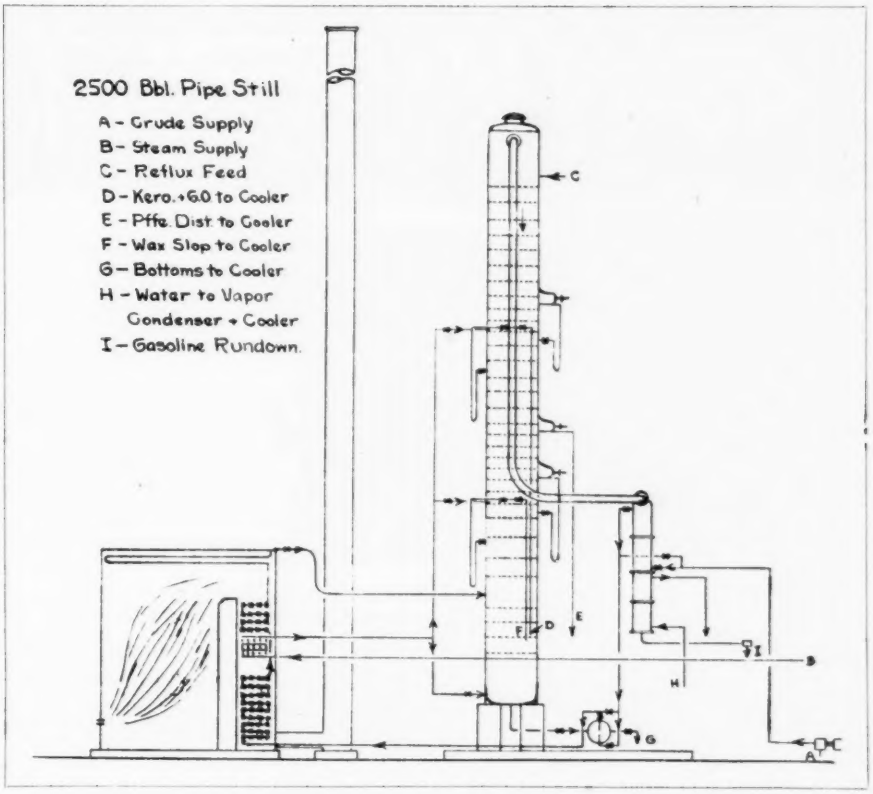
However, since using superheated steam at 600 degrees Pensky-Marten's flashes have risen 40 to 50 degrees from which we are led to conclude that too high superheat on steam can be detrimental. The upper safe limit can possibly be as high as the temperature of the bottoms which are being stripped, but in this case at least cracking resulted without the light vapors formed being entirely removed.

The final development was in the production of 635 steam refined stock, 575 degree flash, 200 viscosity at 210 degrees material with the following results on a test over a six-hour period:

	Bbl.	Hourly bbl.
Total crude feed	618.2	103.0
Total gasoline reflux feed	655.8	109.3
Gasoline yield	236.15	39.35
Kerosene and gas oil yield	136.62	22.77
Paraffin distillate yield	138.48	23.08
635 S R stock yield	102.62	17.10
Loss and errors	4.33	.70
% Gasoline		38.2
% Kerosene and gas oil		22.1
% Paraffin distillate		22.4
% 635 S R stock		16.6
% Loss and errors		.7
		100.0

Tests on Cuts

Gasoline	Overhead	Reflux	Kerosene & Gas Oil	Paraffin Distillate
Gravity	59.3	59.1	41.6	33.3
I. B. P.	122	121	438	578
10%	180	178	462	642
20%	214	212	478	665
30%	240	237	489	684
40%	263	259	499	697
50%	287	286	512	712
60%	308	309	526	728
70%	332	333	540	744
80%	359	362	559	760
90%	392	392	586	776
End Point	428	432	607	.....
% at 221	23.0	23.5	.....	.....
% at 284	49.0	49.5	.....	.....
% at 392	90.0	90.0	.....	.....
Flash	.....	.....	.....	330
Fire	.....	.....	.....	405
Viscosity@100	.....	.....	.....	85
Pour	.....	.....	.....	75


2500 Bbl. Pipe Still
A - Crude Supply
B - Steam Supply
C - Reflux Feed
D - Kero. + G.O. to Cooler
E - Pffe. Dist. to Cooler
F - Wax Slop to Cooler
G - Bottoms to Cooler
H - Water to Vapor Condenser + Cooler
I - Gasoline Rundown

Diagrammatic drawing of a 2500-barrel pipe still

Crude Feed

Gravity	41.2
I. B. P.	141°
10% at	246
20% at	306
30% at	397
36% at	437
37.5% at	455

Bottoms

Gravity	24.5° A. P. I.
Open cup flash	575° F.
Pensky-Marten flash	540° F.
Fire	665° F.
Viscosity at 210°	199
Pour	35
Tar	56%
Color	S R G

Heater Operation

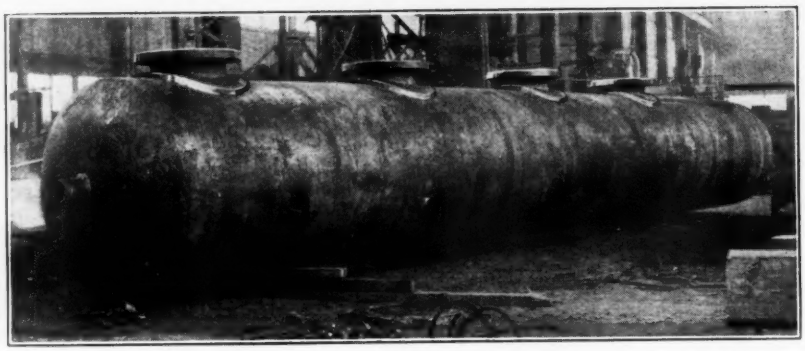
Furnace temperature: West Side 1280° F.
East Side 1260° F.
Flue gas temperature 420° F.....Per cent CO_2 8.5
Draft .02" H_2O.
Barrels fuel oil burned 18.4 bbls.....
.....% on crude 2.96
Temperature oil into heater 259°....Leaving 753°
Pressure oil into heater 108 lb.....Leaving 10 lb.
Pressure steam into superheater 25 lb.....
..... Leaving 15 lb.
Volume superheated steam 1957 lbs./hour..
..... Temperature 590°
Lbs. steam per barrel crude 19.0
Lbs. steam/gal. SR stock 2.72

Tower Operation

Kerosene and gas oil reflux	98%
Paraffin takeoff	30%
Wax slop reflux	100%
Pressure bottom of tower	2¾ lb.
Top of tower	1⅜ lb.
Temperature crude leaving vapor heat exchanger	210° F.
Temperature crude leaving bottoms exchanger	260° F.
Temperature bottoms in tower	690° F.
Temperature bottoms leaving exchanger	520° F.
Pressure crude entering vapor exchanger	133 lb.
Pressure crude entering bottoms exchanger	127 lb.
Temperature top of tower	270°
Average flash on bottoms	575° F.
Pensky-Marten's flash	540° F.

(Continued on Page 92)

BLAW-KNOX FORGE and HAMMER WELDING



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Temperature Variation During Test

Heater inlet	1° F.
Heater outlet	8° F.
Ent. top row roof tubes	5° F.
At paraffin takeoff	7° F.
In bottom of tower	9° F.
At top of tower	None
Temperature drop through transfer line	None

The curves showing analysis of cuts were made from vacuum assays on a Hempel flask and initial boiling points are not quite comparable to the results which would be secured on an A S T M 100 c.c. flask, but these curves show that very well fractionated products are being made.

Electric Motors Drill Kansas Wildcats

WICHITA, Nov. 30.—Electric power for drilling is no longer confined to experimental wells being drilled by the major companies. On the wildcat test being put down by Simmons and Canary, in the SW SE of 9-26S-1E, two miles east of the Gypsy-Marland-Bu-Vi-Bar discovery north of Wichita, Kans., electric motors are doing their stuff in grand style, according to the drillers on the job.

Two 20-50 h.p. Westinghouse Oil Well motors are doing the work on juice furnished from a power company hi-line. The motors are mounted parallel, and are belt connected to a countershaft. As is usual, the band wheel is driven by a belt from a pulley on the countershaft. As the engines are mounted parallel, the belts run to a pulley outside each countershaft bearing, the band wheel pulley being mounted between the bearings. By setting the motors at slightly different speeds, any required motion for drilling is obtained. The motor running the faster tends to "drag" the slower, so that there is no slippage of belts resulting from the difference in speeds.

The forge is oil fired, and is located on the floor, the rig of course being winter boarded. A second water well is being spudded, the first one having been a dry hole—a fact that makes the use of electricity highly desirable.

The crew have fixed themselves up in great style for the cold weather. A garage of the "lean-to" type has been built against the engine (or rather, motor) house; the dog-house on the floor is one from which it will be difficult to stir the chilled scout to make room for the driller (a good tool dresser never sits down); and the water barrel has been boxed in and the surrounding space filled with that favorite oil field heat insulator—manure.

Flash Vaporization of Petroleum To Produce Lube Oil Cuts

By W. A. Peters Jr.,* and J. V. Jirasek**

Read at American Petroleum Institute Meeting, Chicago, Dec. 3-6, 1928

THE authors end this paper with these significant paragraphs: "There is no essential difference between vacuum and atmospheric or single and double stage operation. So much has been said about vacuum distillation recently that there seems to be an idea that remarkable and special results can be accomplished by it. Claims have been made for special heating media and there seemed to be an idea that particularly high grade products could be made by heating the still with certain materials.

"Actually all the available data seems to prove that there is a limit of temperature and time of heating which cannot be exceeded without changing the oil and that if this limit is not exceeded the products will be the same, regardless of the vaporization methods used (provided of course, that similar separations are obtained). The problem is then reduced to finding this limit for the crude and products involved in any particular case and then designing the most economical and practical apparatus to carry out the operation within the temperature and time limits determined."

THE method to be used in vaporizing petroleum will depend on many factors, the most important of which will generally be the quality of the products desired. Next in importance must be considered the first cost and upkeep of the equipment required and the cost of operating. Other factors, such as the amount of material to be handled, the flexibility required of the apparatus, etc., will, of course, be important but so difficult to evaluate accurately that they will not be considered here.

The purpose of vaporizing petroleum is to separate it into parts or fractions according to boiling point or viscosity. Secondary characteristics of the fractions such as specific gravity, flash point, etc., are often made specifications of the products, but these and even the viscosity can all be reduced to boiling point, so that the true boiling point curve of the crude petroleum will give the fundamental data required to solve any problem of vaporizing and separating it into fractions.

Curve A, Fig. I, shows a typical boiling point curve for Ranger crude. The vapor pressure-temperature chart published by O. G. Wilson, Sept. 3, 1927, has been used throughout this paper in reducing boiling points from one pressure to another. Inasmuch as the viscosities of the heavy fractions are usually of more interest than the boiling points, it is convenient to plot curves giving the viscosities of the heavier cuts. Curves B and C, Fig. 1, show the Saybolt-Universal viscosities at 100 degrees Fahr. and 210 degrees Fahr.‡ respectively in the same way

*E. B. Badger & Sons Co.
**E. B. Badger & Sons Co.

‡All viscosities, unless otherwise specified are Saybolt Universal.

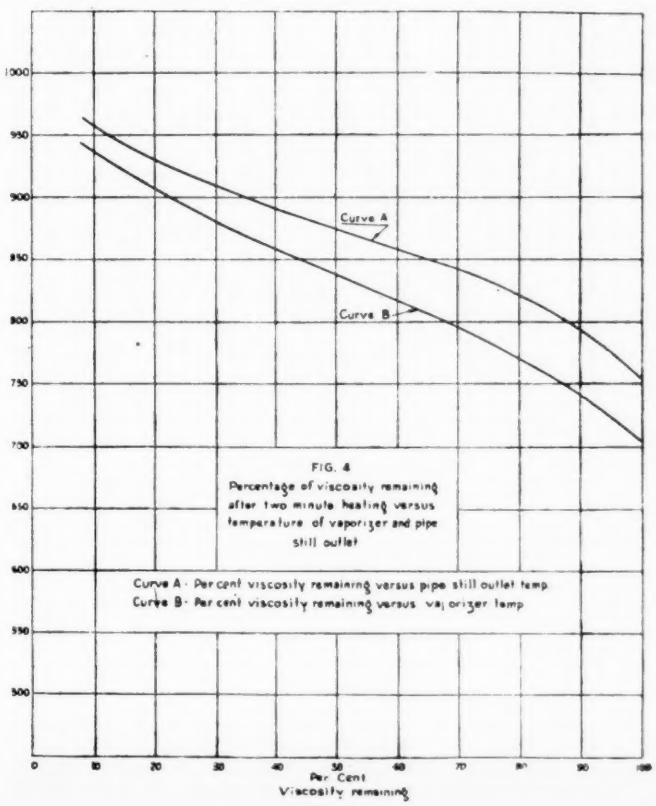

Curve A
Curve B
FIG. 4
Percentage of viscosity remaining after two minute heating versus temperature of vaporizer and pipe still outlet
Curve A - Per cent viscosity remaining versus pipe still outlet temp.
Curve B - Per cent viscosity remaining versus vaporizer temp.
Per Cent Viscosity remaining

Figure 4

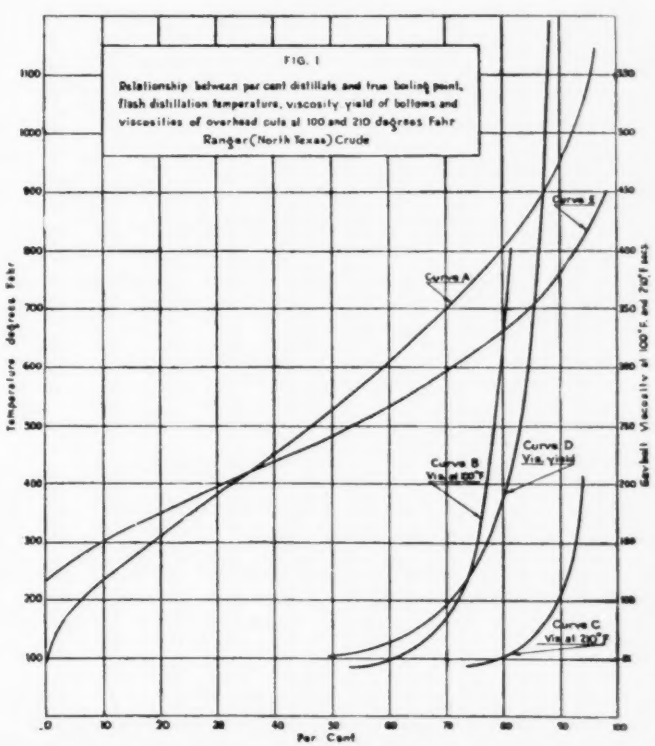


FIG. 1
Relationship between per cent distillate and true boiling point, flash distillation temperature, viscosity yield of bottoms and viscosities of overhead cuts at 100 and 210 degrees Fahr Ranger (North Texas) Crude
Curve A
Curve B
Curve C
Curve D
Per Cent

Figure 1

that curve A shows the boiling point range of the crude. In some cases where a residual cylinder stock is to be made, it is also useful to know the possible yield of a stock of any given viscosity. Curve D gives this information. It will be noted that a point on curve D lies more than twice as far from the right of the chart as a point on the same ordinate curve C. The reason for this is that the heavy residue eliminated from the overhead cuts is of very high viscosity. From these curves can be determined the amounts of fractions of any desired boiling point or viscosity specifications which are present in the crude.

There are many possible methods and combinations of methods of vaporization that may be used as the initial step in the process of separating a crude into desired products. The methods of flash vaporization only will be considered here. The results obtained by single and multiple flash vaporization at lower temperatures were fully worked out by Leslie and Good.** From their results it may be stated that the residue from a single flash contained practically no material boiling 200 degrees Fahr. below the flash temperature and the overhead contained practically no material boiling 200 degrees Fahr. above the flash temperature. They actually found that the A. S. T. M. endpoint of the overhead was 165 degrees Fahr. above the flash temperature. Obviously the overhead and residue may contain some of every compound present in the original crude. However, for the present purpose, the above assumption of a 200 degrees Fahr. overlap above and below the cut point would seem fair. If this point is allowed, it is plain that each flash of a series of multiple flashes may be considered as single provided the temperatures of the successive flashes are not too close together.

This gives an obvious, but useful, rule for both single and multiple flash vaporization: In order to get practically all of a given material out of a residue by flash vaporization, it is necessary to flash at a temperature 200 degrees Fahr. higher than the boiling point of this material.

Leslie and Good plotted the curve showing the relationship between the flash temperature and the yield of distillate. Curve E, Fig. I, shows this relationship for the crude of curve A extended to higher boiling points. This curve is for vaporization at atmospheric pressure and similar curves can be plotted for higher or lower pressures. Furthermore, it appears, that for the purpose of approximate calculations, a large part of the lighter portion of the distillate may be considered as inert gas, so that with due corrections, Curve E can be used to determine the yield of distillate for a given flash temperature not only from the whole crude but from a reduced crude with or without steam and at any pressure. As an illustration of the use of this curve consider several examples of different divisions of the typical crude into various sets of products. In each case the flash temperature is read directly or calculated from Curve E, Fig. I:

Case 1

It is desired to obtain maximum yield of lighter products together with some cracking stock, some intermediate lubricating oil in the wax distillate range and a minimum (7.5 per cent) of tar bottoms, assuming that the gasoline and kerosene are to be so treated that a falling off in their quality due to cracking during the distillation is not important and that preliminary cracking will not in any way injure the cracking stock or the wax distillate.

	Flash temp. degrees Fahr. Calculated	Est. actual
(a) Single flash at 760 mm. without steam—92.5% overhead	795	775
(b) Single flash at 760 mm. with 0.5 lb. steam per gal.††	740	735
Double flash:		
First flash at 760 mm. without steam—59% overhead..	525	525
(c-1) Second flash at 760 mm. without steam—33.5% overhead	905	800
or:		
(c-2) Second flash at 760 mm.‡‡ with 0.8 lb. steam per gal.	750	745

††All steam figures based on crude charged.
‡‡All pressures in mm. absolute.

It will be noted that all the final flash temperatures calculated from Curve E, Fig. 1, are relatively high. Actually there will be some cracking at such temperatures with the result that the products will no longer be exactly the same as those originally present in the crude, but will be lighter and consequently the flash temperature will no longer be that derived from Curve E but will be lower by an amount depending on the cracking.

Fig. 4 shows a very preliminary and approximate set of data on relationship between temperature of heating for a time of two minutes and loss of viscosity of the heavier fractions. The estimated actual flash temperatures in the above example (Case 1) are taken from various experimental data that were used in plotting Fig. 4.

Case 2

It is desired to obtain all the lighter products present and the maximum yield of viscous products. From Fig. 4 it is evident that the flash temperature must not be above 705 degrees Fahr. The following methods would be satisfactory:

	Flash temp. degrees Fahr.
(a) Single flash at 760 mm. with 1.22 lb. steam per gal.....	705
Double flash:	
First flash at 760 mm. without steam—59% overhead....	525
(b-1) Second flash at 760 mm. with 1.575 lb. steam per gal.	705
(b-2) Second flash at 54 mm. without steam	705

Case 3

It is desired to run to a maximum yield of cylinder stock bottoms, viscosity 160 sec. at 210 degrees Fahr. (this is equivalent to running to 22 per cent bottoms). As in the last example, the flash temperature must not exceed 705 degrees Fahr.

	Flash temp. degrees Fahr.
(a) Single flash at 760 mm. without steam—78% overhead....	645
(b) Single flash at 760 mm. with 0.25 lb. steam per gal.....	618
Double flash:	
First flash at 760 mm. without steam—59% overhead....	525
(c-1) Second flash at 760 mm. with 0.115 lb. steam per gal.....	705
(c-2) Second flash at 55 mm. with 0.115 lb. steam per gal.....	535

The cases given above are only a small portion of the possible methods and it is easy to see that a discussion of many of the other possibilities would become very involved. In order to simplify the discussion, it would be well to confine it to two points, namely, fuel consumption and quality of products. The first can be most easily attacked by tabulating the fuel and steam required for the various cases. In order to make them comparable, it will be assumed that the crude can be economically preheated to 375 degrees Fahr. in the single flash systems and that it can be preheated to 400 degrees Fahr. with the same economy in the double flash systems under vacuum and to 425 degrees Fahr. in the double flash systems at atmospheric pressure. The heat value of steam will be taken arbitrarily as 1000 B.t.u. per pound (this is, of course, high if exhaust steam is available). The power requirement for a vacuum pump will be taken arbitrarily as 500,000 B.t.u. per hour per 1000 barrels crude charged per day. On these assumptions the comparative heat requirements will be as shown on Table I.

The figures show very clearly the fuel economy of the vacuum operation and even of the double flash operation without vacuum. It is not safe to

TABLE I

Heat Requirements for Various Methods of Flash Vaporization of Ranger Crude

Case:	Heat in pipe still B.t.u.'s per hour per 1000 bbl. per day	B.t.u. value of steam (@ 1000 B.t.u./lb.)	Heat for vacuum pump	Total heat duty B.t.u.'s/hr.
1—(a)	4,615,000	.....	.....	4,615,000
1—(b)	4,225,000	875,000	.....	5,100,000
1—(c-1)	2,350,000	.....	.....	2,350,000
1—(c-2)	2,193,000	1,400,000	.....	3,593,000
2—(a)	3,950,000	2,135,000	.....	6,085,000
2—(b-1)	2,035,000	2,755,000	.....	4,790,000
2—(b-2)	2,226,500	.....	500,000	2,726,000
3—(a)	3,200,000	.....	.....	3,200,000
3—(b)	2,960,000	436,000	.....	3,396,000
3—(c-1)	1,914,000	201,000	.....	2,115,000
3—(c-2)	1,478,200	201,000	500,000	2,179,200

**Ind. and Eng. Chem., 19, 453 (1927).

draw very definite conclusions from generalizations made on the basis of such broad assumptions, especially as power for pumps and many other important items have been left out of consideration. It is, however, safe to say that the two stage operation with the second stage operating under vacuum will always be the more economical method from a fuel standpoint alone.

As the price of the fuel becomes higher, the vacuum unit will be more attractive. At present fuel costs, however, the simplicity and other advantages of the single stage unit will often outweigh the difference in increased fuel cost and the single stage unit will be preferable.

Where the quality of the products is of prime importance, the vacuum unit has a greater advantage, but again only on account of a saving in fuel, for obviously it is always possible to get any results at atmospheric pressure with steam that can be obtained under even the lowest vacuum. The production obtained in Case 2 (a) and Case 2 (b-2) would be identical providing proper equipment were used, but over twice as much fuel is required in the atmospheric operation to get the same results.

This has, of course, been known for many years and has been thoroughly discussed and explained, for example by Gurwitsch in Scientific Principles in Petroleum Technology, published in 1913. The Ranger crude which has been used in these calculations has a relatively low boiling range, so the differences in fuel between vacuum and atmospheric operation are not as great as they would be with a high boiling Pennsylvania crude.

The difference is, however, only one of relative economy and it would be quite possible to get, for example, a 150 vis. at 210 degrees Fahr. Pennsylvania cylinder stock overhead at atmospheric pressure with steam. An enormous amount of steam would be required to accomplish the result without cracking and the method would not be practical on a large scale.

The point is that there is no essential difference between vacuum and atmospheric or single and double stage operation. So much has been said about vacuum distillation recently that there seems to be an idea that remarkable and special results can be accomplished by it. Claims have even been made for special heating media and there seemed to be an idea that particularly high grade products could be made by heating the still with certain materials.

Actually all the available data seems to prove that there is a limit of temperature and time of heating which cannot be exceeded without changing the oil and that if this limit is not exceeded the products will be the same regardless of the vaporization method used (provided, of course, that similar separations are obtained). The problem is then reduced to finding this limit for the crude and products involved in any particular case and then designing the most economical and practical apparatus to carry out the operation within the temperature and time limits determined.

Curing Halitosis in Refineries

By David E. Day*

Read at American Petroleum Institute, Chicago, Dec. 3-6

THE subject of refinery odors and their control has come into importance only comparatively recently. For many years good citizens have lived adjacent to refineries and have either suffered in silence or have failed to find the breezes wafted from the plants disagreeable. I believe that two factors have contributed to the present difficulties of some of our urban refineries.

First is the increase in cracking with its attendant treating difficulties and—second, the awakening of civic consciousness induced by Chambers of Commerce, civic advertising, and that sort of thing. In spite of the mouth wash advertisements, even those who are not our best friends are beginning to comment, quite rudely, about our industrial halitosis, and to insist that something be done about it.

This situation was brought home quite forcibly to the refiners in the Los Angeles Basin district when every refining company, natural gasoline plant, and dehydrating plant in the Long Beach-Watson area was served with a summons to appear before the city fathers of Long Beach and show cause why their plants should not be summarily shut down on the grounds that they constituted a public nuisance. Inasmuch as nearly every refinery was being supplied through pipelines existing by virtue of revocable permits issued by the City of Long Beach, the city fathers had the whip hand and they knew it. They gave the refineries 60 days to correct the situation, with a warning that pipeline permits would be revoked at the end of that time if the Long Beach ozone continued to be polluted.

MAYBE your best friend won't tell you—but the neighbors will—about refinery halitosis Mr. Day points out. He knows, because the residents of Long Beach, Calif., and vicinity told the refiners of that neighborhood in no uncertain terms and gave them 60 days to stop the smells or close down the plants.

Some hard—and fast—thinking was done by the refinery technologists. How they fixed things up so the refineries are still operating and the residents thereabouts are mollified, is told in this article. Many who have to operate plants in thickly settled communities will sympathize with the California refiners and read Mr. Day's article with interest.

The oil companies proceeded to appoint a committee to investigate and report, and it is with the findings of this committee and the remedies proposed and enacted that this paper deals.

A survey of conditions in the Long Beach-Watson area developed that there are six main sources of odor in the refinery operations in this district, as follows:

1. Fumes from acid hydrolizers,
2. Fumes from acid precipitators,
3. Caustic wash water,
4. Fixed vapors from lubricating oil vacuum stills,
5. Fixed vapors from oxidizing asphalt stills,
6. Fixed vapors from cracking stills.

It is apparent at once that the remedy for five of these sources of trouble is mechanical. All of the fixed vapors can be burned and thus permanently disposed of. On the other hand, satisfactory disposal of caustic wash water is a chemical problem, necessitating the precipitation of the evil smelling bodies and their subsequent removal.

The Pan-American refinery near Watson furnished a very good example of what can be done to control fumes and fixed gases. A very elaborate system was put into effect at this plant which completely eliminated all trouble from these sources.

The system includes three major units. The first of these is located near the acid sludge hydrolizing and

*Refinery Engineer, Richfield Oil Co.

separating plant, the vacuum stills and the asphalt oxidizing stills and controls the fumes and vapors from these three sources. Fumes from the sludge acid hydrolizers are collected in a lead pipe line system and brought under pressure to Dutch oven type furnace.

Here they are mixed with fixed vapors from the vacuum pumps operating the lubricating stills, and the asphalt oxidizing stills. This mixed fume and vapor is burned in the Dutch oven, together with enough additional oil and gas fuel to insure complete combustion and to keep a low percentage of sulfur dioxide in the stack gases.

A unique feature in this plant is that the Dutch oven is operated to furnish heat for a separately fired boiler feed water heater, through which is pumped all of the feed water for the boiler plant which serves the lubricating department. By this means the heating value of the fumes and vapors is utilized, and the unit pays its way as it gets rid of the smell nuisance.

A second method used at the Pan-American plant which indirectly eliminates one source of odor is a complete vapor recovery system at the cracking plant. This system was built primarily to recover the gasoline content of the fixed gases from the cracking plant, but when the odor problem arose it was extended to recover the vapors from the cracked distillate run-down tanks and in fact, from every vent in the cracking process. As at present operated, the plant operates as a completely vapor tight system, all gases are collected and scrubbed in an absorption plant and the dry gases are burned under the cracking stills.

Another recovery system is being installed in the straight run units of the refinery but due to the fact that gasoline from the cracking plant recovery system is sour and requires treating, this unit is operated entirely independently.

Another important source of odor from this same refinery was the acid recovery plant. Originally fumes from the precipitators were allowed to vent through a stack, but this did not prove to be a satisfactory method of disposal. After considerable experimentation, a furnace was built in which the fumes were oxidized.

As the plant now operates, the fumes are collected from the Cottrell precipitators by a motor driven exhausting fan built of lead. They are blown into the rear end of the furnace and pass through it over a bridge wall and are preheated during this passage. At the front end of the furnace the heated fumes pass into the combustion chamber where sufficient oil or gas is burned to completely oxidize the fumes and to keep the percentage of sulfur dioxide in the stack gases so low that they will not be obnoxious.

The three units discussed give a good example of how fume difficulties can be solved in a large refinery. As at present operated, the plant emits no obnoxious odors, and two of the three units are not only self sustaining from a cost standpoint but maintain the expense of the third and pay interest on the entire investment. The other problem of refinery odor, caustic wash water, was solved in an interesting way at the Ricco refinery of the Richfield Oil Co. At this plant no sewer mains are available, and waste water from the plant flows through an open ditch to a swampy area along the railroad right of way. The caustic wash water from the cracked distillate treating plant contains dissolved phenols and cresols as well as small quantities of pyridine bases.

These substances are not particularly obnoxious in their dissolved form, and as long as the solution is kept alkaline. However, their oxidation products are exceedingly evil smelling and if the solution is acidified the phenols and their homologues are precipitated. The result was, that wash water, comparatively odorless when pumped out of the plant, eventually became the source of very disagreeable odors. This problem required a chemical solution—the water had to be disposed of and before disposition the phenols had to be removed. A process was finally worked out by which hot flue gases are blown through the caustic solution. The carbon dioxide combines with the soda to form sodium carbonate and the phenols, cresols, and pyridine bases are precipitated. The water, now containing a small percentage of sodium carbonate, is quite odorless and is used to soften the water in the cooling tower pits. The operation of the system is very simple.

The apparatus consists of a storage tank, a filter, a treating tank and a compressor. Caustic wash water is collected in the storage tank and is pumped through the filter to remove any lead and thence into the treating tank. Hot flue gases from the cracking furnaces are now blown through the caustic water until a complete separation of the phenols has taken place. These are removed and the water is pumped into the cooling tower pits.

The methods just described are typical of those generally adopted by the refiners in the Long Beach-Watson district to meet a critical situation. They were hurriedly developed and still more hurriedly put into effect, but they have been very successful in eliminating the smell nuisance.

New Stations Building

Note: Material used in this column is principally taken from newspapers. NATIONAL PETROLEUM NEWS *assumes no responsibility for its accuracy.*

Dallas, Tex.—J. C. Thompson, filling station.
Hutchinson, Kans.—Phillips Petroleum Co., filling station.
Greenville, S. C.—H. M. Hester, filling station.
E. Liverpool, O.—Freedom Oil Co., filling station.
Philadelphia, Pa.—Charles Kahn, filling station.
Ellzabeth, N. J.—Linden Motor Sales Co., filling station.
Concordia, Kans.—White Eagle Oil Refining Co., filling station.
Walnut Ridge, Ark.—Dr. T. Z. Johnson, filling station.
Parsons, Kans.—Jesse Burnette, filling station.
Fayetteville, Ark.—C. D. Carmichael, filling station.
Jacksonville, Fla.—James H. Walsh, filling station.
Dayton, O.—Leo A. Stotter, super service station.
Flat River, Mo.—W. H. Armbruster, filling station.
Denver, Colo.—Superior Refining Co., filling station.
Astoria, Ore.—Richfield Oil Co., filling station.
Maquoketa, Ia.—Louie Hoerner, filling station.
Waterloo, Ia.—Fowler Bros., filling station.
Waterloo, Ia.—Wayne S. Raymond, filling station.
Davenport, Ia.—Chas. Blanck, filling station.
Marshalltown, Ia.—K. J. Wilson, filling station.
La Crosse, Wis.—L. A. Keizer, filling station.
Baraboo, Wis.—Pennsylvania Oil Co., filling station.
Fremont, Neb.—Reynolds Bros., filling station.
Wever, Ia.—Standard Oil Co., filling station.
Lancaster, Wis.—Standard Oil Co., filling station.
Chillicothe, Mo.—Mid-Continent Petroleum Co., filling station.
Flat River, Mo.—Mr. Barker, filling station.
Carmi, Ill.—Alpheus Boster, filling station.
Waseca, Minn.—White Eagle Oil Co., filling station.
Tama, Ia.—Mid-Continent Petroleum Co., filling station.
Omaha, Neb.—Manhattan Oil Co., filling station.
Moline, Ill.—D. L. Esterdahl, filling station.
Bishop, Tex.—R. D. Michalk, filling station.
Charlotte, N. C.—J. B. Harty, filling station.
Augusta, Ga.—Pan-American Petroleum Corp., filling station.
Bonifay, Fla.—W. H. Terry, filling station.
Jonesville, Mich.—Perry Kimball, filling station.
Dorchester, Ill.—B. Clark & C. Caskey, filling station.
Ottawa, Ill.—La Salle County Farm Supply Co., bulk oil station.
Toledo, O.—Ohio Fuel Gas Co., storage tank.
Stuart, Fla.—Fred Odom, filling station.
Stuart, Fla.—H. O. Green, two filling stations.
Galena, Mo.—Ozark Oil Co., filling station.
Nashville, Mich.—Dixie Service Co., filling station.
Clarion, Pa.—Charles Eisenhuth, filling station.
Port Chester, N. Y.—John Pendle, filling station.
Hopewell, Va.—The Texas Co., filling station.
Anacortis, Wash.—Union Oil Co., filling station.
Kingstree, S. C.—C. A. Milhous, filling station.
Sebastopol, Calif.—Standard Oil Co., filling station.
Fordyce, Ark.—Sheridan Service Station owners, filling station.
Howell, Mich.—McPherson Oil Co., filling station.
Toronto, Ont.—Imperial Oil Co., Ltd., filling station.
Northfield, Minn.—Pioneer Oil Co., filling station.
Maysville, Mo.—J. W. Thornton, filling station.
Ashland, Mo.—A. G. Morris, filling station.
Albuquerque, N. M.—Sinclair Refining Co., filling station.
Chicago, Ill.—W. A. Redick, filling station.
Raleigh, N. D.—W. P. Stayner, filling station.
Worthington, Minn.—G. A. Luffey, filling station.
Hastings, Neb.—Continental Oil Co., filling station.
Casselton, Md.—G. J. Hatfield, filling station.
Roundup, Mont.—Burton Oil Co., filling station.
Medford, Wis.—Joe Lenard, filling station.

The Handling of West Texas Crudes

GRIEF the like of which they had never met with before, camped upon the doorsteps of the first refiners who tried to make marketable petroleum products out of West Texas crudes.

Not that grief is anything new to the refiner. Nearly every crude he has ever had to handle and process has enjoyed some ornery qualities of its own which he has learned to conquer. But the West Texas crudes were really terrible.

Corrosive to the point where they would chew out the roof and bottom of a tank in a few weeks and play the devil with stills, condensers and other distillation equipment—to say nothing of cracking stills and their appurtenances—West Texas crudes were something to reckon with. Gasoline made from them was naturally too high in sulfur to meet U. S. Motor specifications which forbid more than 0.10 per cent.

But refiners are working out the problems connected with refining this sulfur laden crude and treating its products to a marketable state. Hundreds of thousands of barrels of high gasoline crude are coming out of the fields of Upton, Crane, Pecos and Winkler counties and are going through the refiners' stills without causing prohibitive damage.

Millions of gallons of gasoline from this crude are daily driving automobiles in the states that make up Standard of Indiana and Standard of Ohio territories, as well as in the territory close to the refining centers where the crude is made into serviceable products.

Among refinery executives and technologists who have had much experience in handling these crudes since they first came into the petroleum picture about two years ago, are the two men whose papers discussing these problems are published below. These papers contain some of the most interesting and valuable information that has been published on problems connected with the handling of West Texas crudes.

Both were read at the American Petroleum Institute meeting, Chicago, Dec. 3-6, 1928.

Refining West Texas Distillates

By H. H. Hewetson*

EXTENSIVE study has been given to the problem of overcoming the corrosive action of these crudes; the difficulties of refining these crudes have not been as generally discussed. It is with this latter problem that the present paper is chiefly concerned.

The following crudes are in general representative of the production from West Texas fields:

Field	Gravity	Sulfur	Gasoline content	S in 410° E. P. gasoline without treatment
Crane-Upton	20° API	2%	20%	.16%
Winkler	29° API	1.5 -1.75%	20-25%	.20-23%
Pecos	30° API	1.25-1.75%	20-25%	.18-20%

It will be noted that these crudes have, in general, somewhat similar properties. The gravities range from 28-30 degrees A.P.I., with a gasoline content of 20-25 per cent; the sulfur in the crude ranges from 1.25-2 per cent, and the sulfur in straight-run gasoline of 410 degrees end point contain 0.16 per cent to 0.23 per cent sulfur before treatment.

When we distill these crudes on a laboratory scale to 600 degrees F. vapor temperature and absorb with caustic soda the non-condensable gases which are given off, we find that between 1 and 2 grams of hydrogen sulphide is evolved by each liter of the crude. This content of hydrogen sulphide is quite high, and shows that the crude carries considerable hydrogen sulphide gas in solution. When these crudes are topped, deposits of free sulfur are formed in the condenser tubes showing that elemental sulfur is also dissolved in the crude oil.

The overhead fractions from topping are unusually high in sulfur and extremely difficult to sweeten, which indicates that the crude contains considerable amounts of organic sulfur-containing compounds such as mercaptans, thio-ethers, disulfides, etc. Every crude contains sulfur to some extent and in some one of the three forms mentioned, but apparently in West Texas crude we have the undesirable case of all three forms of sulfur and sulfur compounds present in considerable amounts

(*Continued on Page* 99)

*Beacon Oil Co.

Refining Pecos County Crude

By Sidney Born*

THE Yates pool in Pecos county, Texas, was opened by a well completed Oct. 28, 1926, by the Transcontinental Oil Co. and the Mid-Kansas Oil & Gas Co. Since that time, more than 270 producing wells have been completed covering a productive area of over 14,000 acres. The productive sand is reached at depths varying from 900 to 1700 feet. An open flow test of this field was made on Sept. 15, 1928, and showed a production of 3,835,651 barrels daily.

The average crude oil produced in this field shows a Baume gravity of 29.6 degrees and the sulfur content is 1.55 per cent. One of the characteristics of this crude is its low pour test, which is a decided advantage as it enables the oil to be handled readily through pipe lines at all times of the year. The viscosity of this crude has been determined at various temperatures and the results are given in graph "A." Another remarkable property of this crude is the fact that gasoline produced from it by direct distillation has a high anti-knock value. Engine tests show that the straight run gasoline from Pecos crude has an automotive equivalent of 47 per cent benzol in admixture with Pennsylvania straight run gasoline.

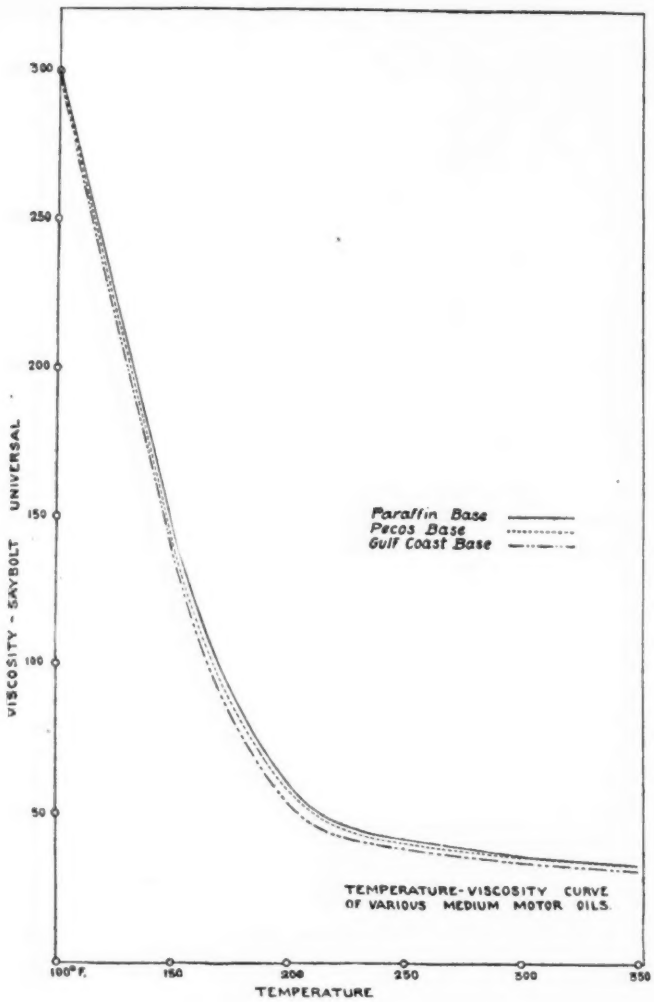
Pecos crude contains considerable amounts of lubricating oil, having a naturally low pour test, the lubricating oil fractions being obtained by direct distillation without the necessity of processing the distillate by means of refrigeration. Detailed analyses are given herewith showing the chemical and physical properties of this crude and the various distillates obtained therefrom.

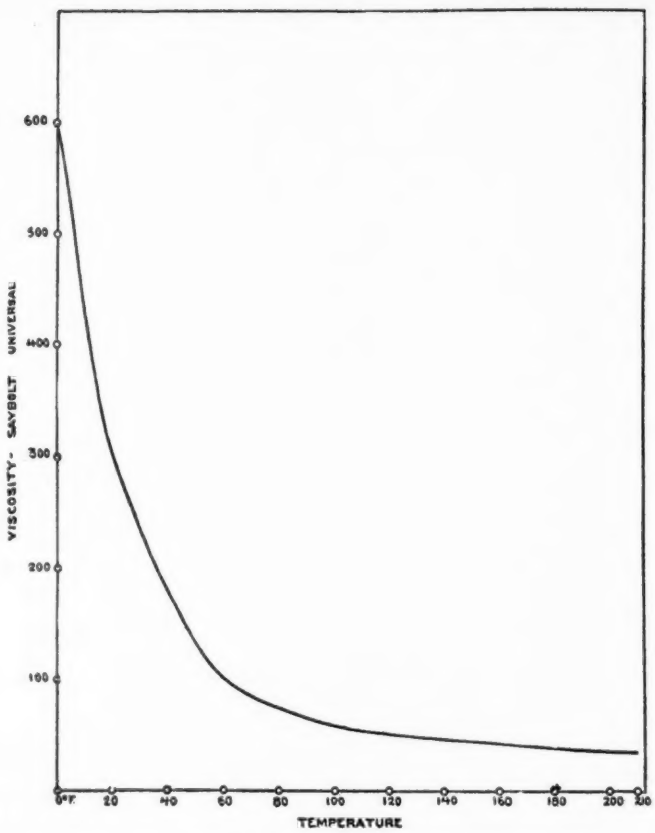
By a simple skimming distillation, 25 per cent of 437 end point blending naphtha can be removed, leaving a topped crude having an A.P.I. gravity of 22.1 degrees and a sulfur content of 1.84 per cent. This topped crude can be cracked** directly, producing 45.40 per cent of cracked gasoline, 9.50 per cent of pressure distillate bottoms and 18.10 per cent of coke and gas. If the

(*Continued on Page* 98)

*Transcontinental Oil Co.

**The results of "cracking" under various conditions are based on data obtained by the Universal Oil Products Co., Chicago.





Above—Temperature-viscosity curve of various medium motor oils

At left—Viscosity of Pecos crude at various temperatures. Gravity of crude, 29.6 A. P. I.

pressure distillate bottoms are recycled, the total yield of cracked gasoline will be 49.40 per cent, making a combined yield by cracking and topping of 74.40 per cent. In the above process, 37 pounds of coke and 428 cubic feet of gas are produced per barrel of original crude oil.

If it is preferred to crack to a heavy fuel oil, the following yields will be obtained:

	Per Cent
Blending naphtha	25.00
Cracked gasoline	41.50
Pressure distillate bottoms	3.70
Bunker "C" fuel oil	20.20
Loss (coke and gas)	9.60

The blending naphtha produced by the topping operations has an A.P.I. gravity of 54.8 degrees, initial boiling point of 140 degrees, 20 per cent over at 226 degrees, 50 per cent over at 284 degrees, 90 per cent over at 366 degrees, and a maximum boiling point of 430 degrees. The initial and 20 per cent point can be modified to meet U. S. Motor gasoline specifications by the addition of a small percentage of casinghead gasoline.

The naphtha cut can be sweetened and made noncorrosive by treatment with caustic soda and litharge in the ordinary way. Our tests show that the best results were obtained by giving the naphtha a preliminary wash with 3 per cent of 25 degree Baume caustic soda solution, following this up with 5 per cent (by volume) of 18 degree doctor solution. The doctor solution contained the equivalent of one pound litharge per barrel of naphtha treated. .02 pounds of sulfur per barrel of naphtha was used to complete the reaction. Naphtha treated in the above manner was sweet and noncorrosive when tested according to A.S.T.M. Method No. D-130-27T.

Tests on Pecos County Crude

Gravity	29.6°
B. S. and water	None
Sulfur	1.55%
Pour test .....Zero° F.	
Viscosity Saybolt Universal at 100° F.	61

The fuel oil remaining after topping off 40 per cent of the crude flows freely at zero, making it an especially desirable fuel oil for cold weather.

In running Pecos crude to lubes, approximately 28 per cent of gas oil is produced and this would make an excellent cracking stock. By cracking this fraction, approximately 45 per cent of cracked gasoline could be obtained therefrom, which would increase the gasoline yield of the crude about 12 per cent. The lubricating oil fractions can be readily treated, any desired color being obtained by the use of the proper amounts of acid and clay.

The lubricating oils made from Pecos crude were carefully tested to see whether these oils had any corrosive action on metals. Polished copper strips were immersed in the oil, heated to 212 degrees F. for a period of from one to eight hours. At the end of that time, the strips showed no discoloration, pitting or tarnish. Viscosities of the lubricating oil fraction from the Pecos crude were run at temperatures ranging from 100 degrees F. to 350 degrees F. and compared with typical samples of paraffin base and coastal lubricating oils. It is interesting to note that the Pecos lubricating oil viscosity curve followed the paraffin base oil curve very closely. The viscosity curves are shown in the graphs accompanying this article.

The crude oil from Pecos county we have examined is practically free from salt water; tests showing that only approximately 10 pounds of sodium chloride could be obtained from the distillation of 1000 barrels of crude oil. No magnesium or calcium chloride is present. In this respect Pecos county production differs markedly from Panhandle crude. Panhandle or Amarillo crude contains a large amount of saline matter; tests showing as high as 447 pounds per 1000 barrels of crude, a large percentage of this being present in the

Simple Distillation

Product	%	Grav.	IBP	20%	50%	90%	MBP	Flash	Fire	Pour T	Visc.	Sulfur	Color
Naphtha	25.00	54.8	140	226	284	366	430	.....	.....	.....	.....	.....	.....
Burn. Oil	5.80	39.3	.....	.....	.....	.....	.....	150	180	.....	.....	.....	.....
Gas Oil	11.30	34.8	.....	.....	.....	.....	.....	185	215	.....	.....	.805%	.....
Hy. Dist.	28.50	25.7	.....	.....	.....	.....	.....	280	325	Below 5° F.	72	1.708%	4½
Fuel Oil	26.70	14.9	.....	.....	.....	.....	.....	520	600	.....	467	2.950%	.....
Loss	2.70												

Running to 300 Viscosity Lubes

Product	%	Grav.	IBP	20%	50%	90%	MBP	Flash	Fire	Pour T	Visc.	Sulfur	Color
Naphtha	25.00	54.8	140	226	284	366	430	.....	.....	.....	.....	.....	.....
Burn. Oil	5.80	39.3	.....	.....	.....	.....	.....	150	180	.....	.....	.....	.....
Gas Oil	28.10	29.7	.....	.....	.....	.....	.....	225	265	.....	.....	.....	.....
300 Neut.	15.00	22.6	.....	.....	.....	.....	.....	390	460	Zero	300	.....	3½
Hy. Neut.	8.70	21.3	.....	.....	.....	.....	.....	515	600	10°	90@210°	.....	5 Red
Asphalt	15.00	.....	.....	.....	.....	.....	.....	580	690	.....	.....	.....	.....
Loss	3.40												

Running to 500 Viscosity Lubes

Product	%	Grav.	IBP	20%	50%	90%	MBP	Flash	Fire	Pour T	Visc.	Sulfur	Color
Naphtha	25.00	54.8	140	226	284	366	430	.....	.....	.....	.....	.....	.....
Burn. Oil	5.80	39.3	.....	.....	.....	.....	.....	150	180	.....	.....	.....	.....
Gas Oil	29.50	29.0	.....	.....	.....	.....	.....	230	275	.....	.....	.....	.....
500 Neut.	22.30	22.3	.....	.....	.....	.....	.....	425	480	0°	500@100°	.....	Red
Asphalt	15.00	.....	.....	.....	.....	.....	.....	580	690	.....	.....	.....	.....
Loss	3.40												

form of calcium and magnesium chlorides.

The percentage of sulfur present in a crude bears no relationship to its corrosive properties. The form in which the sulfur is combined determines this. Hydrogen sulfide seems to be the most active corrosive agent, although other sulfur compounds may cause corrosion due to oxidation to sulfurous and sulfuric acids. The exclusion of oxygen cuts down this phase of corrosion.

Generally speaking, crude oil containing more than 4 per cent sulfur is classified as "sour," but in some cases, crudes having a sulfur content even lower than this are more difficult to refine than other crudes which have as high as 2 per cent sulfur content. Crudes produced in California have a sulfur content running from as low as .2 per cent to as high as 4 per cent, while Mexican crudes will run as high as 5 per cent sulfur and probably the average of all Mexican crudes will run about 3 per cent sulfur. There are many crudes produced in Wyoming which run over 2 per cent sulfur. As we have indicated above, the sulfur content itself is no criterion of the corrosiveness of the crude itself.

A preliminary investigation of the nature of the sulfur compounds in the Pecos crude was undertaken and the following results were obtained:

	Per Cent
Total sulfur	1.55
Sulfur as hydrogen sulfide	.026
Sulfur as elementary sulfur	.025
Sulfur as mercaptans	.052

This analysis indicates that most of the sulfur is combined as stable sulfur compounds and further investigation substantiates the belief that most of the sulfur is combined as a complex organic radical which is practically as stable as the hydro-carbons themselves. This stability is indicated not only by the failure to break down under high heat and pressure but also by their resistance to alkaline reagents.

Pecos crude was heated with aqueous solutions of sodium hydroxide, sodium carbonate and doctor solution, respectively, in a bomb up to a temperature of 375 degrees F. and a pressure of 175 pounds per square inch. Sulfur determinations made before and after the above treatment showed a reduction of only .15 per cent in the sulfur content.

A study was also made of the sulfur compounds in the raw untreated Pecos naphtha using the method recently developed by Faragher, Morrell and Monroe, for the analysis. The following results were obtained:

	Per Cent
Hydrogen sulfide	.003
Elementary sulfur	.012
Mercaptans sulfur	.044
Disulphide sulfur	.032
Sulphide sulfur	.082
Residual sulfur	.049
Total sulfur	.222

Based on today's market prices, Pecos crude shows a considerably better realization than Mid-Continent crude of the same A.P.I. gravity. Notwithstanding the above, the market prices of Pecos crude today is 30 cents per barrel less than that of Mid-Continent crude of the same gravity.

Wells now completed and geological data available indicate that West Texas contains the world's largest potential source of crude oil. Therefore, it is incumbent upon the petroleum industry to make a very careful study of this source of supply and of the various products which can be obtained by refining the same. Considerable work has already been done by the technical and manufacturing departments of various companies toward solving these problems. Considerable still remains to be done but we are quite certain that the oil industry with their technical, scientific and manufacturing staffs will solve these problems just as they have solved many more difficult ones during the past two decades.

Refining West Texas Distillate

(*Continued from Page* 97)

in the same crude.

Various types of operation, depending in large measure on the types of equipment available, have been used in the refineries which are operating on West Texas crudes. If the crude is topped to give a well fractionated straight-run gasoline of good end-point, a sulfur content before treatment of 0.16 per cent to 0.25 per cent may be expected. When acid is treated and sweetened with sodium plumbite without rerunning, the finished gasoline will have a sulfur content between 0.10 per cent and 0.15 per cent, though the gum content will be somewhat high. If instead this acid treated stock is rerun with the addition of gas oil or sweet crude bottoms, the finished gasoline will be below 0.10 per cent sulfur with a good gum test.

Frequently a distillate is produced containing 80-90 per cent of end point gasoline; this distillate will require 10-15 pounds of 66 degree acid, and when rerun and sweetened will give a gasoline having below 0.10 per cent sulfur and a fair gum content.

The residue from such a topping operation may be further reduced, giving an intermediate cut which is used as charging stock for cracking stills, or the topped residue may be cracked directly. The treatment of the cracked gasoline produced by either method to meet sulfur specifications presents a much more difficult refining problem than does the straight-run gasoline. Probably the simplest way to overcome the sulfur problem in West Texas cracked gasolines is to run in addition enough

sweet crude to give a blended gasoline which will meet specifications.

By this procedure, however, the price advantage of West Texas crudes over sweeter crudes is to some extent sacrificed, and in some refineries the necessary amount of sweet crude is not available at any reasonable price. As another possibility, the distillate may be double acid treated and double rerun.

Such a procedure may be considered as the refiner's last resort; it has never failed on other crudes and has not failed on West Texas crude, but is so much more expensive than single treatment that it may be more profitable to shift to other crudes than to refine West Texas crudes by this method. . . .

IT IS not my purpose at this time to call to your attention the tremendous sums expended yearly for chemicals to meet the requirements of a specification, nor to dwell on the economic losses due to the action of these chemicals, nor yet to comment on the quality of the gasoline which would be produced if the use of these chemicals were reduced or discontinued entirely. Our efforts have been concentrated on finding a cheaper and more satisfactory means of reducing sulfur in the distillates from West Texas crudes so that these distillates may meet existing specifications.

In approaching such a problem we must differentiate between the viewpoint of the research chemist and that of the refinery manager. In the laboratory it is possible to treat a crude distillate by any one of a considerable number of processes and obtain as a finished product a gasoline containing less than 0.10 per cent sulfur.

The correct procedure on the part of the chemist who attacks a problem such as we are considering is first to find out as many methods as possible of attaining the end which he seeks, and only then to give consideration to the factor which is of chief interest to the refinery manager—the production of a desirable product at an economically profitable cost. As a specific instance, it has been found that by treating crude cracked distillate of about 0.3 per cent sulfur content with a saturated aqueous solution of mercuric acetate and then with a little acid, a gasoline will be produced on rerunning which requires a very little doctor for sweetening and which is well under 0.1 per cent sulfur.

This method is altogether satisfactory in the laboratory, but because of the cost of the chemicals involved is obviously out of the question as a practical refining method. Our research staff has tried out hundreds of treating methods; some, like the one mentioned above, have indicated processes which were theoretically effective but practically out of consideration.

It is my hope, however, that some of the other procedures that I will outline may lead to results, either in our laboratories or in the hands of other workers, which will be both effective and profitable in the refinery.

Sulfuric Acid Treatment

The customary treatment of crude cracked distillates with sulfuric acid is largely for the purpose of reducing the sulfur content of the distillate. There can be no question that sulfuric acid has this effect, but the use of this treatment costs money for the acid, brings about a shrinkage in the volume of the distillate and accordingly in the volume of salable gasoline, removes from the distillate constituents of great value for anti-knock purposes, and (when an excess of acid is used) may result in serious corrosion of rerun stills, condensers, and tankage.

There are at least four variables involved in acid treatment: strength of acid, quantity of acid, temperature at which the treatment is carried out, and time of exposure of the distillate to acid. The grades of acid generally available are 60 degrees, 66 degrees, 98 per cent, and 20 per cent oleum. Our experiments have indicated that acid as dilute as 60 degrees is too weak for ordinary refinery use on distillates from West Texas crude; acid of gravities between 60 degrees and 66 degrees freeze at temperatures so high (up to 46 degrees F.) that these strengths are not suitable for cold climates, so that 66 degree acid is the lowest customary grade. Acid stronger than 98 per cent will not reduce the sulfur content of the finished gasoline below a point attainable with larger quantities of 66-degree or 98 per cent acid, and extracts an unduly large proportion of desirable constituents, as well as having a tendency to give a gasoline unstable to light and of high gum content. There can be no doubt that 98 per cent acid is a more effective treating agent than 66-degree acid, but the stronger grade leaves in the treated distillate, even after a caustic wash, compounds (probably alkyl sulfates) which evolve free acid on rerunning, and thereby bring about very serious corrosion of rerun stills, condensers and coolers, run-down lines, etc.

THE quantity of acid used should be regulated by the amount of sulfur which must be removed from the distillate. The use of a large quantity of acid will reduce the amount of sulfur in the distillate very greatly; e. g., treatment of a crude cracked distillate containing 0.38 per cent of sulfur with 30 pounds of 60-degree acid per barrel, followed by rerunning, reduced the sulfur to 0.03 per cent in the unsweetened gasoline. The use of a large quantity of acid, however, increases the treating costs, increases the loss on treating, and may introduce serious difficulties in handling the fresh and the spent acid.

The temperature at which treatment is carried out markedly affects the intensity of the action of the acid on the constituents of the distillate. Sulfuric acid as a treating agent may act in either of two ways: as a solvent or as a polymerizing agent. From its chemical structure,

$$O{=}S{-}OH,$$
$$O{=}\ {-}OH,$$

sulfuric acid like liquid sulfur dioxide might be expected to exert a particular solvent action on the organic sulfur compounds which are to be removed from crude distillate.

If the treatment is carried out at temperatures well below 32 degrees F., this solvent action may take place almost without resinification of the unsaturated hydrocarbons which are so desirable as anti-knock constituents of gasoline.

A paper read about a year ago by R. A. Halloran of the Standard Oil Co. of California (Proceedings, 1927, Annual Meeting, p. 153) describes the use which his company has made of this principle. At the usual treating temperatures, the action of the acid is primarily to resinify unstable compounds and remove them as sludge. This involves shrinkage in volume which may roughly correspond to the volume of fresh acid used, but with the disadvantage of the heavy economic loss thus caused (which may exceed $50,000,000 a year in the United States) there is nevertheless the beneficial effect of removing the undesirable sulfur compounds.

IN general it may be said that if the temperature of treatment is increased, the amount of acid of a given strength may be decreased or the same amount of weaker acid used to give an equal treating effect, or a more intense treating effect attained with other conditions held constant.

Careful regulation of the time of the treatment is important for several reasons. The ability of the sulfuric acid to resinify desirable compounds continues after the sulfur-removing power of the acid has been exhausted. To avoid excessive treating losses, the distillate should be exposed to action of the acid no longer than is necessary to reduce the sulfur to the desired point.

We have found that when treating West Texas distillates, the settling time after acid treatment should also be reduced as much as possible; if the distillate is left in contact with the acid for an hour or more, some secondary reaction takes place (probably the formation of alkyl sulfuric acids) which increases the amount of sulfur in the distillate.

The use of continuous treating towers rather than batch agitation of the distillate and acid by air

blowing is a very desirable change in the last decade. As a general principle, a continuous process, whether distilling or acid treating, is more economical of time and materials and more readily controlled than a batch process. The loss of light ends by air blowing, while relatively small is, in the aggregate considerable. More important than this, however, is the fact that acid in the presence of air (as in air-blown batch treatment) removes much more of the desirable anti-knock constituents than does continuous treatment, with no corresponding advantage in sulfur reduction.

A PRELIMINARY treatment with doctor or hypochlorite tends to reduce the amount of sulfur in the treated distillate, but the same result may be attained at less expense by using more acid. The same is true as regards a treatment with doctor or hypochlorite before rerunning. One would think that a preliminary wash of the crude cracked distillate with caustic would tend to reduce sulfur in the treated distillate by removing any hydrogen sulfide which might be present in the distillate, but our experiments with this form of treatment on West Texas stocks have given conflicting results indicating that the method is at best of limited value.

If after acid treatment, the treated distillate is neutralized with clay instead of with water or caustic, the sulfur content of the treated distillate is reduced, but the gasoline obtained on rerunning is not improved. For example, a crude cracked distillate containing 0.28 per cent sulfur before treatment showed 0.26 per cent after treatment when neutralized with caustic and only 0.15-0.18 per cent when neutralized with clay. In both cases, however, the gasoline obtained on rerunning these distillates contained 0.12 per cent sulfur.

I do not need to mention the important problems involved in handling and recovering the chemicals used in treating crude distillates. Within the past few years a number of methods have been developed which enable the refiner to reduce his expenditure for litharge by 60 per cent to 80 per cent. Notable among these are the method involving reoxidation of lead sulfide to sodium plumbite by blowing with air, and the method of the Litharge Recovery Corp. in which the lead sulfide is converted to lead sulfate by treatment with sulfuric acid, and the lead sulfate then dissolved in caustic to form doctor solution.

At our refinery the latter process has been used very successfully for a number of years. Sludge acid, like the poor, we have always with us. The disposal of this product is a very real problem in almost every refinery, and acid recovery processes are valuable rather as a means of removing an undesirable waste product than as a means of appreciably reducing refinery expenses. . . .

Sodium hypochlorite as a sweetening agent is well known and widely used, but this reagent does not seem to have any appreciable effect on the sulfur content of West Texas gasoline except as it avoids the danger incident to the use of doctor solution of adding an excess of sulfur to break out lead mercaptide in the form of lead sulfide. The use of an excess of hypochlorite or of hypochlorite in too concentrated solutions seems to bring about chlorination of some of the compounds present in crude distillate and thereby gives rise to residual acidity, high gum content, and instability to light. As I have already mentioned, the use of hypochlorite before acid treatment gives no desirable results which cannot be more economically obtained in other ways.

Vapor Phase Treatment

A considerable number of experiments were carried out in an attempt to reduce the sulfur content of gasoline by treatment in the vapor phase. Experimental runs were made using fuller's earth, bauxite, pumice wet with phosphoric acid, and oxides of calcium, barium, cadmium, and aluminum. Towers containing these solids were used in connection both with straight fire distillation and distillation with fire and steam. Further experiments were carried out in which the gasoline vapors were conducted through tubes containing these solids at temperatures of 600-1000 degrees F. Certain combinations of conditions resulted in a gasoline which was wholly or nearly sweet, but in no case did the sulfur content of the gasoline seem to be appreciably reduced.

Metallic Chlorides

From a theoretical standpoint the use of anhydrous chlorides of the bivalent, trivalent, and tetravalent metals seemed to offer particular promise of success, since it is well known that these salts show a marked tendency to form addition compounds with many organic compounds which possess the secondary valence that we might expect from complex sulfur compounds. Because of these hopes our experiments were all the more disappointing, leading as they did only to negative results.

CONSIDERABLE work was done with mercuric chloride, cuprous chloride, and cupric chloride, with water, hydrochloric acid, and ammonium hydroxide as solvents. In no combination of conditions did these salts seem to affect the sulfur content of the gasoline. The chlorides of copper seemed to form no addition compounds, or at most, compounds which were very unstable. Mercuric chloride, on the other hand, seemed to form compounds which tenaciously resisted any attempt to wash them out of the distillate: on evaporating a distillate which had been treated with mercuric chloride, the gum which was obtained was coated with droplets of metallic mercury.

As has been stated above, the use of saturated aqueous solutions of mercuric salts (particularly mercuric acetate) in conjunction with a sulfuric acid treatment seems to reduce the sulfur by 0.04 per cent or 0.05 per cent below that attainable by the use of acid without the mercuric salts. This is possibly due to the formation of addition compounds by the organic sulfur compounds and the mercuric salts, part of which are removed in the aqueous solution and the remainder of which are made more susceptible to the action of sulfuric acid.

THE anhydrous chlorides of trivalent and tetravalent metals—aluminum chloride, antimony chloride, bismuth chloride, ferric chloride, stannic chloride, and titanic chloride—will, in general, sweeten the gasoline, but fail to decrease its sulfur content. That these salts actually form addition compounds with some constituents of the distillate is indicated by the high gum content which the distillate shows before rerunning. The most active of these salts are the chlorides of aluminum, antimony, and tin. Aluminum chloride seems to have a particularly marked action, and our results indicate that this salt tends to convert unsaturated compounds to saturated compounds rather than to remove the unsaturates. A sample of West Texas distillate after treatment with aluminum chloride gave practically no color when shaken with sulfuric acid according to the usual test for unsaturates, and its color remained 30 Saybolt after more than a year's exposure to sunlight.

Conclusions

The problems confronting the refiner who wishes to use West Texas crudes is three-fold. First, he must make the best use of the facilities which he has in regulating his refining process to give products which are as low in sulfur as possible. This involves suitable choice of topping, cracking, and rerunning operations, possible desirability of blending gasoline from West Texas crudes with gasoline from sweet crudes, etc. Second, he must determine the best way to adapt the customary acid-doctor-rerun treatment to the product which he has to turn out and the equipment he has to work with. Third, he must bear in mind that the treatment of West Texas distillates presents a new and tremendously important problem to the industry, which can be solved only by the most careful study, and which will generously repay a successful solution.

Report Shows Oil Striding On While Coal Lags Behind

WASHINGTON, Dec. 3

A PICTURE in figures, showing oil and gas advancing with seven league boots, to provide the country with British thermal units, is presented in a special report by the Bureau of Mines showing the relative rate of growth of coal, oil, and water power.

The big advance has been going on since 1918, which is the year of the peak production of coal, both hard and soft. The report was prepared by F. G. Tryon, statistics section of the coal division and embodied in tables.

The tables, according to the Bureau of Mines show that while coal production in 1927 was far below wartime maximum, production of oil, natural gas and water power had increased enormously since the war.

Of course, those facts have been known every year since 1918 but the Tryon tables present the matter in a bit different form. He shows the increase by showing the effect produced by the coal, gas, oil and water power in terms of British thermal units. In the first of three tables Mr. Tryon reduces the annual supply of energy from mineral fuels and water power to a common denominator, that is, trillions of units. Water power is represented by B.t.u. of coal necessary to produce the same amount of power, the conversion factors being shown.

To make comparisons easier, the figures of heat units are reduced to index numbers in the second table. That table shows that the production of soft coal in 1927 was 11 per cent less than in 1918 and all coal 12 per cent less. The production of oil, on the contrary, was 153 per cent greater and of natural gas 101 per cent greater. Imports of oil increased 55 per cent in the period, and the total supply of energy in the form of oil and gas increased 133 per cent over 1918. Water power in the same decade increased 102 per cent.

The total production of energy was 13 per cent greater in 1927 than in 1918. To sum up, while coal fell off notably, gas and water power doubled and oil increased more than 150 per cent.

"The total supply of energy increased," said Mr. Tryon, "but all the increase and some of the old demand went to sources of energy other than coal.

"It was formerly true that only an insignificant part of the total supply of energy was produced from sources other than coal. That is no longer the case. In 1913 oil and gas contributed only 12.9 per cent of the energy of fuels; in 1918 only 14.9 per cent, but in 1927, oil and gas contributed 31.7 per cent. The share of coal declined in the meantime from 87.1 per cent in 1913 to 68.3 per cent in 1927. Coal is still the dominant source but up to 1927 it was declining. Of the other sources of power oil and gas are the larger. Water power, though steadily growing, contributed only 7.3 per cent as much energy as did the fuels."

The percentages in 1927 were: Anthracite coal, 9.5; soft coal, 58.8; domestic oil, 23.5; natural gas, 6.7; imported oil, 1.5; and water power, as before set forth only 7.3 per cent as much energy as the fuels.

The figures cover decades from 1819 onward to 1909. Since that time they cover 1913 and 1918 and every year since that time.

NEW PATENTS

November 6

REFINING

Apparatus for Controlling Cracking Stills—William C. Parrish, Port Arthur, Tex., assignor to The Texas Co., New York, N. Y. Filed Apr. 16, 1924. No. 1,690,243.

Cracking of Liquid Hydrocarbons—Owen David Lucas and Ernest Lawson Lomax, Westminster, London, England. Assignors to B. L. Oil Processes, Ltd., Westminster, England. Filed uly 23, 1925. No. 1,690,416.

Oxidation of Hydrocarbons—Arthur W. Burwell, Chagrin Falls, O., assignor to Alox Chemical Corp., New York, N. Y. Filed Sept. 13, 1922. No. 1,690,768.

Process of Making Organic Acids from Petroleum Hydrocarbons and Product—Arthur W. Burwell, Chagrin Falls, O., assignor to Alox Chemical Corp., New York, N. Y. Filed May 31, 1923. No. 1,690,769.

Treatment of Mineral Oils—Thomas G. Delbridge and Henry F. Dure, Philadelphia, Pa., assignors to The Atlantic Refining Co., Philadelphia, Pa. Filed May 21, 1925. No. 1,690,772.

Motor Fuel—Samuel P. Marley, Pittsburgh, and William A. Gruse, Wilkinsburg, Pa., assignors to Gulf Refining Co., Pittsburgh, Pa. Filed Aug. 25, 1924. No. 1,690,988.

Process of Making Aluminum Chloride—Almer M. McAfee and Gerald I. Roberts, Port Arthur, Tex., assignors to Gulf Refining Co., Pittsburgh, Pa. Filed Sept. 26, 1927. No. 1,690,990.

Apparatus for Treating Oils — Carbon P. Dubbs, Wilmette, Ill., assignor to Universal Oil Products Co., Chicago, Ill. Filed July 9, 1917. No. 1,690,997.

PRODUCTION

Screw-Type Well Packer — Harry Thomson, Houston, Tex., assignor to Stancliffe Well Screen & Manufacturing Co., Houston, Tex. Filed June 29, 1925. No. 1,690,383.

Deep-Well Pump—Harry Beloit, San Pedro, Calif., assignor to Economy Pump and Oil Tool Co., Los Angeles, Calif. Filed Dec. 14, 1925. No. 1,690,393.

Plug for Wells—Stephen L. Hartman, Santa Ana, Calif. Filed June 20, 1927. No. 1,690,536.

Pump Plunger—Rees H. Lemmon, Long Beach, Calif. Filed Mar. 22, 1926. No. 1,690,687.

Rod Guide and Protector—Stephen V. Dillon, Tulsa, Okla., assignor to Smith Separator Co. Filed May 7, 1926. No. 1,690,721.

NATURAL GAS

Gas-Purification Process and Apparatus—Frederick W. Sperr, Jr., Pittsburgh, Pa., assignor to The Koppers Co., Pittsburgh, Pa. Filed June 6, 1924. No. 1,690,437.

Recirculating Process and Apparatus for Gas Purification—Frederick W. Sperr, Jr., Pittsburgh, Pa., assignor to The Koppers Co., Pittsburgh, Pa. Filed June 6, 1924. No. 1,690,438.

Apparatus for Cleansing and Cooling Gases—Otto Hubmann, Frankfort-on-the-Main, Germany, assignor to Metallbank & Metallurgische Gesellschaft Aktiengesellschaft, Frankfort-on-the-Main, Germany. Filed Nov. 8, 1926. No. 1,690,635.

MISCELLANEOUS

Separating Liquids of Different Specific Gravity and Means Therefor—William George Gordon Pirie Lumsden, London, England, assignor to Rodway Stephens, London, England. Filed Mar. 31, 1926. No. 1,690,741.

Apparatus for Distilling Solid Combustible Carbonaceous Material—Otto Hubmann, Frankfort-on-the-Main, Germany. Filed Oct. 8, 1925. No. 1,690,933.

Process and Apparatus for Distillation of Combustible Materials—Otto Hubmann, Frankfort-on-the-Main, Germany, assignor to Metallbank & Metallurgische Gesellschaft Aktiengesellschaft, Frankfort-on-the-Main, Germany. Filed July 12, 1926. No. 1,690,934.

November 13

REFINING

Process of Treating Hydrocarbons—Alfred Schwarz, Montclair, N. J., assignor to Petroleum Sand Products Corp. Filed Mar. 1, 1924. No. 1,691,085.

Process of Making Thickened Lubricating Oil—Robert W. Henry, Port Arthur, Tex., and Elford D. Streeter, Bayonne, N. J., assignors to Gulf Refining Company, Pittsburgh, Pa. Filed Mar. 24, 1926. No. 1,691,654.

Process of Producing Thickened Lubricating Oil—Robert W. Henry, Port Arthur, Tex., and Elford D. Streeter, Bayonne, N. J., assignors to Gulf Refining Co., Pittsburgh, Pa. Filed Mar. 24, 1926. No. 1,691,882.

PRODUCTION

Crown-Block Apparatus—Thomas F. Campbell, Oklahoma City, Okla. Filed June 28, 1926. No. 1,691,430.

Well-Drilling Tool—Lester C. Black, Los Angeles, Calif. Filed June 17, 1925. No. 1,691,623.

MISCELLANEOUS

Method and System for Protecting Petroleum Tanks and Tank Farms Against Lightning.—West Dodd, Des Moines, Iowa. Filed May 15, 1926. No. 1,691,340.

Bolter for Carbon Black, etc.—William S. Hoskins, Warren, Pa., assignor to Columbian Carbon Co., Williamsport, Pa. Filed Dec. 13, 1924. No. 1,691,572.

November 20

REFINING

Process and Apparatus for Fractionating Hydrocarbon Oils—John C. Black, Destrehan, La. Filed Feb. 2, 1924. No. 1,692,072.

Motor Fuel and Process of Making Same—Lester Kirschbraun, Chicago, Ill. Filed Nov. 19, 1919. No. 1,692,176.

Process of Treating Hydrocarbons—Gustav Egloff, Chicago, Ill. Filed July 19, 1918. No. 1,692,203.

Method and Apparatus for Cracking and Rectifying Petroleum Oils and the Like—James M. Wadsworth, Sand Springs, Okla. Filed Mar. 12, 1926. No. 1,692,476.

Desulphurizing Hydrocarbon Oils—Robert C. Moran, Woodbury, N. J., assignor to Vacuum Oil Co., New York, N. Y. Filed Jan. 18, 1927. No. 1,692,756.

Fuel and Fuel Ingredients—John W. Orelup, East Orange, and O. Ivan Lee, Jersey City, N. J., assignors to Boyce-Ite Products, Inc., Cincinnati, O. Filed Jan. 23, 1925. No. 1,692,784.

PRODUCTION

Fishing-Tool Guide—Richard D. Hill and Walter W. Foster, Wichita Falls, Tex. Filed Jan. 31, 1927. No. 1,691,972.

Deep-Well Pump—William C. Parrish, Port Arthur, Tex. Filed Apr. 16, 1924. No. 1,692,050.

Well-Flowing Device — Wilbert L. Martin, Tulsa, Okla. Filed Sept. 8, 1927. No. 1,692,131.

Oil-Well Packer—Alfred P. Machris, Los Angeles, Calif. Filed June 20, 1927. No. 1,692,181.

Support—Rex G. Hamaker, Houston, Tex., assignor to A. M. Bowman, Houston, Tex. Filed June 1, 1925. No. 1,692,209.

Well-Capping Device and Controlling Head—Albert Orvall Hessemer, Fullerton, Calif. Filed May 2, 1925. No. 1,692,302.

Pumping Mechanism — Claude W. Hughes, Odessa, Tex. Filed July 3, 1926. No. 1,692,304.

Packer for Working Barrels—Patrick H. Bray, Huntington Beach, Calif. Filed Nov. 1, 1926. No. 1,692,485.

Oil-Well Packing Head—William D. Shaffer, Brea, Calif., assignor to E. J. Williams, Whittier, Calif.; George S. Fosnaugh, Compton, Calif. Filed Oct. 10, 1925. No. 1,692,582.

Process Conversion of Cylinder Stock Sludge to Burnable Fuel Oil

By L. W. Barbour*

Read at American Petroleum Institute Meeting, Chicago, Dec. 3-6, 1928

This paper describes a method of converting into a satisfactory plant fuel the sludge resulting from the treatment of cylinder stock with sulfuric acid.

The method has been developed at the refinery of the Pierce Petroleum Corp. It consists of fluxing the sludge with fuel oil. According to the author, the fluxed sludge makes a suitable fuel for use in pipe still or shell still furnaces. He says the small amount of ash is carried out with the waste gas and does not build up on the exposed surfaces to cause local overheating.

He has found also that no ill effects are apparent from the acid content that remains in the fuel after fluxing.

AT THE Sand Springs refinery of the Pierce Petroleum Corp., we have developed a very simple and economical process for disposing of acid sludge yielded from 180 to 230 viscosity steam refined stock as plant fuel. A description of the equipment used and the procedure follows:

Two kettles which were formerly used as acid separators in an acid recovery system, were rehabilitated for use in the sludge fluxing process. They have a capacity of 250 barrels, are 26 feet 6 inches in diameter at the top and taper to 22 feet 6 inches at a distance 9 feet 6 inches below the top. From this point a 30 degree cone serves as the bottom of the kettle. The kettles are equipped with coils AA (see sketch), through which steam or air can be admitted for purposes of agitation. Steam and air may also be admitted through the suction line B.

The acid treating and the cylinder stock is divided into two equal dumps and the two batches of sludge are fluxed in separate kettles. To start the process a quantity of 13-15 gravity fuel oil equal to the amount of sludge, is pumped into the kettle and the agitation started by admitting air through the suction line B, entering the bottom of the kettle.

Typical tests on fuel oil are:

Gravity	13.3
Flash	168 (Pensky-Martens)
Pour Test	0-0
B. S.	1.0%

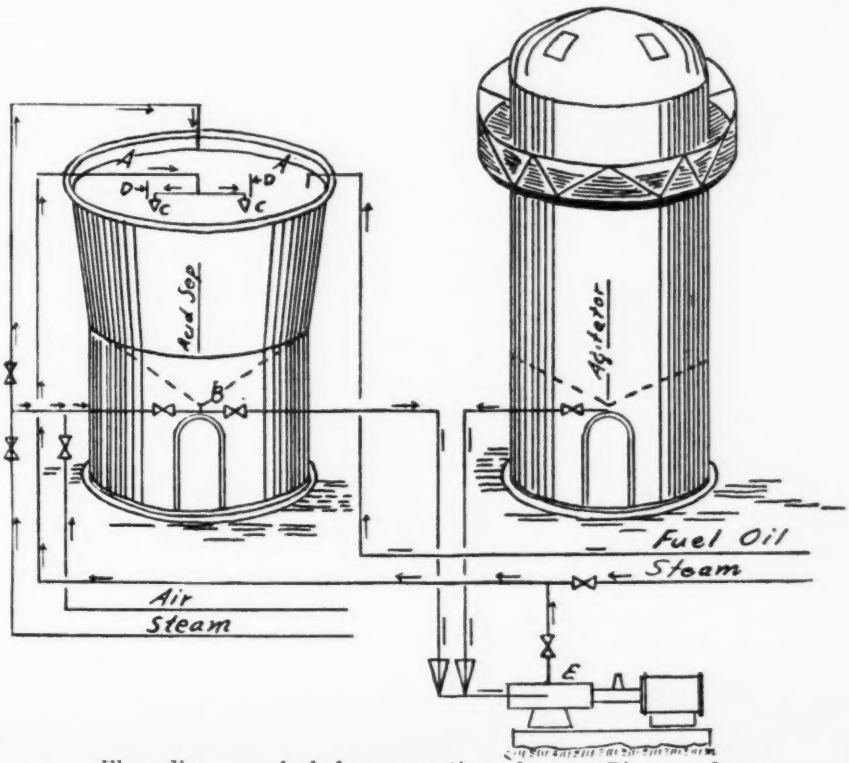
Practice has shown that the temperature of the fuel oil should not exceed 120 degrees F. to obtain best results. The cylinder stock is treated at a temperature of 160 degrees F. and the sludge formed from the first dump of acid is pumped into the kettle through strainers at the top of the kettle shown on the drawing as CC. These strainers consist of short 12-inch pipe with welded bottom plates which are perforated with ¼-inch holes. They are equipped with steam connections DD shown on the drawing, so that they may be steamed in case they become plugged up. The strainers aid in breaking up and disintegrating the sludge mass.

While the sludge is being pumped into the kettle the contents are kept well agitated by means of air introduced at the bottom of the kettle through the suction line B. This eliminates the possibility of the sludge falling to the bottom of the kettle and forming a hard mass which would be difficult to work off.

When all the sludge, about 125 barrels, has been transferred to the kettle, air is introduced through a line extending over the top and into coils which are installed on the inside walls of the kettle. Introduction of air through these coils gives the contents of the kettle the necesary agitation and during this agitation the air is cut off the bottom inlet at B shown on the drawing.

This air agitation is kept up for 5 to 10 minutes at which time a pump E shown on the drawing, takes suction from the bottom of the kettle and discharges into it again through the strainers. During this circulation operation the temperature of the oil is raised to 180 to 200 degrees F. by means of closed steam coils. This circulation and agitation is continued until the batch is completed or when all the sludge has dissolved into the

*Pierce Petroleum Corp.



Flow diagram of sludge converting plant at Pierce refinery

fuel oil giving a smooth homogeneous product.

An ideal batch will contain no grit or lumps when completed. We obtain occasional batches, however, that contain a small percentage of solid matter but we have experienced no particular difficulty in burning the oil by reason of this.

Occasionally we have difficulty in breaking up the sludge with the use of air alone. In such cases we have found that by shutting off the air and introducing steam instead, the condition can be overcome.

If by chance the sludge should begin settling to the bottom of the kettle, we have found it can be worked back into the oil by the introduction of steam through the suction line at the bottom of the kettle.

There are several factors which determine the ease and success with which a batch of sludge is fluxed off. If a higher temperature than 160 degrees F. is used for acid treating the sludge will be hard and gritty and will form a harder coke. Difficulties are also encountered when trying to disintegrate such a hard sludge in the fuel oil. If the correct temperature is used for acid treating and the temperature of the fuel oil is too high at the beginning of the fluxing operation, the sludge will coke and harden when it comes in contact with the hot oil and will cause difficulty in handling.

Sludge from the second acid dump is handled slightly different in that a greater percentage of fuel oil is used to work it off; 125 barrels of fuel oil are used to about 40 barrels of sludge. This is necessary because of the hardness of the second sludge as compared to the first and the greater difficulties in disintegrating and dissolving it in the fuel oil.

The time required for completing a batch of sludge varies from one to four hours depending upon the nature of the sludge.

Burning of the Sludge Fuel

When the sludge fuel is judged to be of satisfactory quality it is pumped into a fuel storage tank at the still battery. The oil is kept agitated with a small quantity of live steam and the tank is equipped with a pump which takes suction on the bottom and discharges back through the top, thus keeping the fuel oil in constant agitation and preventing the formation of any solids which would tend to settle out. The fuel oil is fed by gravity to injector type oil burners which have been installed under all stills.

Quality of Fuel

Average tests on a completed batch of sludge fuel are:

Gravity	10.3
Ash	0.15%
Acidity	1.0%
B.t.u. per lb	16,800

Sludge fuel as manufactured in the above manner is found to be a satisfactory fuel for heating the shell and pipe stills at the refinery. Although it would appear that there would be some disadvantages in the use of such a fuel, no difficulty has been encountered. The small amount of ash in the fuel is carried out with the waste gases and none of it has accumulated on the still bottoms or tubes. This eliminates any objection that a deposit would build up on the exposed surfaces and eventually cause local overheating.

The acid nature of the sludge presents no practical difficulty as the acidity is not high and to date no corrosion of tubes, still bottoms, flues or stacks has been noted.

Value of Sludge Fluxing and Comparison With Other Methods

Little argument is necessary to convince one of the advantage of preparing fuel oil from sludge. The fact alone that a substance which has formerly gone to waste is converted into a product having a practical use and a market value proves the worth of any process. Especially is this so when the process shows an actual profit as is the case in this instance.

The advantages of this fluxing method are marked and outstanding when compared with other methods which call for neutralizing the sludge with lime or caustic. The most important of these is the fact that no chemicals are used in preparing the fuel. This not only decreases the cost of the fuel but leads to other advantages. It results in a process which is simple in nature and easy to operate. Elimination of chemicals also means that no special or expensive equipment such as agitators or mixers are necessary and the capital investment will therefore be low. Sludge fuel prepared by this method has a much lower ash content than a fuel prepared by treatment with chemicals and consequently gives less trouble as far as deposits on the tubes, still bottoms, and flues are concerned.

LOS ANGELES, Nov. 30.—Capt. John F. Lucey of Dallas, Texas, is in California on an extended visit, spending most of his time with his daughters at Bakersfield.

Oil Company Radio Programs

For Week Starting Dec. 9

NATIONAL PETROLEUM NEWS *offers you in these two columns the time and stations through which many oil companies over the country offer their radio entertainment programs. If other oil companies will furnish the announcements of their programs in advance they will be included in this program.*

Following are the oil industry radio programs for the week of Dec. 9. All time is central standard, and p.m., unless indicated.

Sunday, Dec. 9

8:00-9:00 a.m.—KFDM, Magnolia Petroleum Co., religious service.

11:00-12:00 a.m.—KFDM, Magnolia Petroleum Co., religious service.

12:00-1:00—WHK, Pocahontas Oil Co., "Blue Flash Indians" (orchestra).

12:00-1:00—KFDM, KPRC, Magnolia Petroleum Co., Star quartet.

6:30-7:00—KFON, Hancock Oil Co., orchestra.

11:00-12:00—KFON, Hancock Oil Co., "All Star Nite."

Monday, Dec. 10

12:35-1:00—KFDM, Magnolia Petroleum Co., organ recital.

5:30-6:30—WHK, Pocahontas Oil Co., "Blue Flash Indians" (orchestra).

6:20-9:00—KFON, Hancock Oil Co., orchestra.

8:00-9:00—KFYM, WRR, Magnolia Petroleum Co., Magnolia band and orchestra, Dallas.

Tuesday, Dec. 11

12:30-1:00—KFDM, WFAA, Magnolia Petroleum Co., Magnolia Refinery Band.

6:20-8:45—KFON, Hancock Oil Co., orchestra.

6:30-7:00—WTAM, WLW, Standard Oil Co. of Ohio.

6:30-7:00—WEAF, WEEI, WTIC, WJAR, WTAG, WCSH, WGY, WGR, Standard Oil Co. of New York, Soconyland Sketch, over National Broadcasting Co. chain.

8:00-10:00—KFDM, Magnolia Petroleum Co., Magnolia orchestra.

Wednesday, Dec. 12

12:30-1:00—KFDM, Magnolia Petroleum Co., studio program.

6:20-9:00—KFON, Hancock Oil Co., orchestra.

11:00-11:30—KFI, KHQ, KOMO, KGW, KGO, KPO, Associated Oil Co., Jack and Ethyl, "The Motor Mates," over Pacific coast National Broadcasting Co. chain.

Thursday, Dec. 13

12:35-1:00—KFDM, Magnolia Petroleum Co., organ recital.

5:30-6:30—WHK, Pocahontas Oil Co., "Blue Flash Indians" (orchestra).

1:30-2:00—KFI, KGO, KGW, KOMO, KHQ, KPO, Standard Oil Co. of California, Standard school broadcast, over Pacific coast National Broadcasting Co. chain.

6:20-9:00—KFON, Hancock Oil Co., orchestra.

9:30-10:30—KFI, KGO, KGW, KOMO, KHQ, Standard Oil Co. of California, Standard Symphony Hour, over Pacific coast National Broadcasting Co. chain.

Friday, Dec. 14

12:30-1:00—KFDM, WFAA, Magnolia Petroleum Co., Magnolia band.

6:20-9:00—KFON, Hancock Oil Co., orchestra.

7:00-8:00—WEAF, WTAM, WEEI, WLIT, WRC, WGR, WCAE, WWJ, WSAI, KYW, WCCO, KSD, WOC, WOW, KVOO, WDAF, WFAA, KOA, Cities Service Oil Co., Cities Service Hour, over National Broadcasting Co. chain.

8:00-10:00—KFDM, WRR, Magnolia Petroleum Co., Magnolia Refinery band, Beaumont.

9:00-10:00—KFDM, Magnolia Petroleum Co., Magnolia Refinery band.

10:00-10:30—KFI, KTO, KPO, KHQ, KTW, KOMO, KFAI, General Petroleum Corp., General Independents, over Pacific coast National Broadcasting Co. chain.

Saturday, Dec. 15

12:30-1:00—KFDM, KPRC, Magnolia Petroleum Co., miscellaneous entertainment.

7:00-9:00—KFDM, KPRC, Magnolia Petroleum Co., miscellaneous entertainment.

6:20-9:00—KFON, Hancock Oil Co., orchestra.

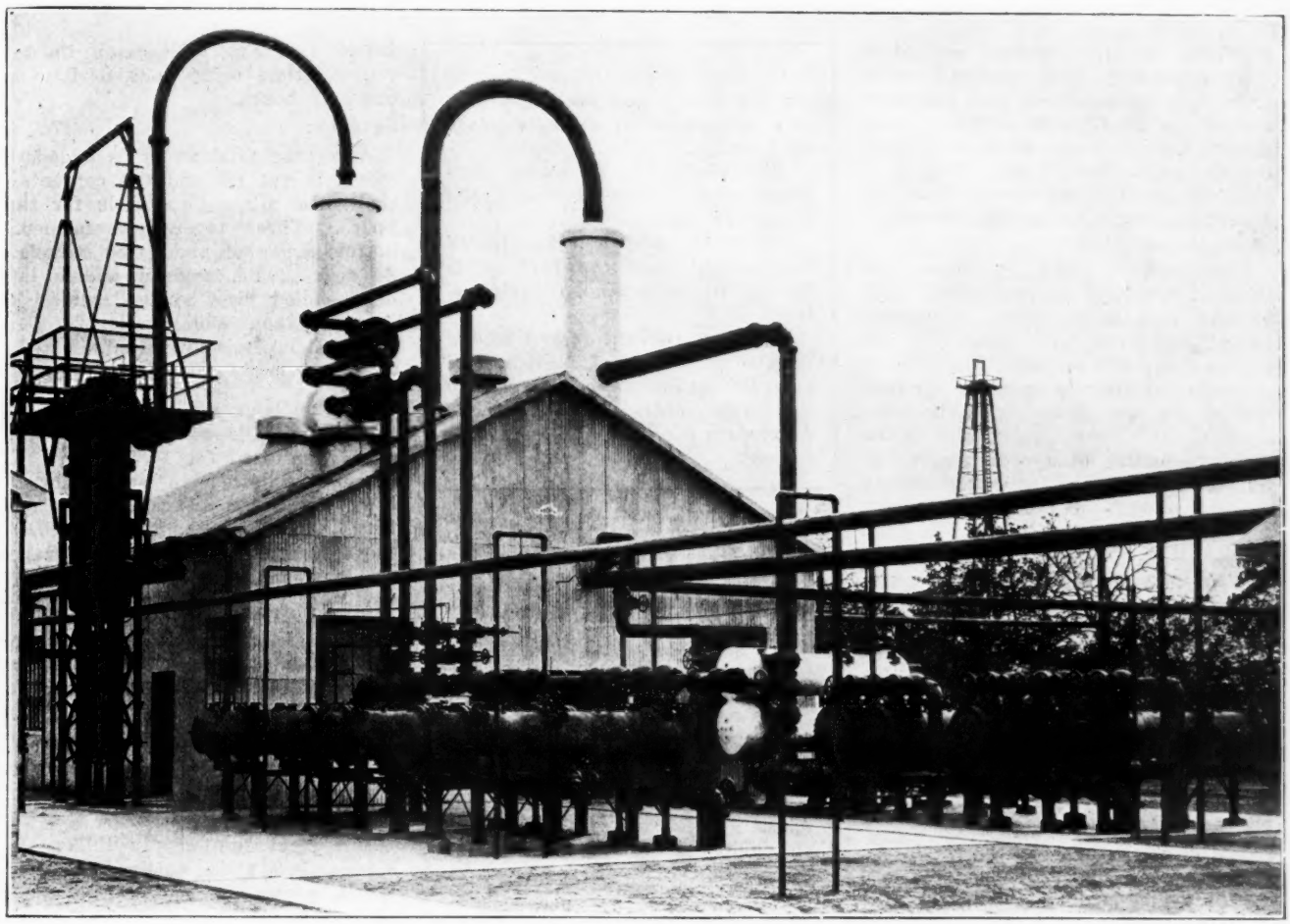
9:00-10:00—KFDM, WFAA, Magnolia Petroleum Co., barn dance.

General

KOIL, Monamotor Oil Co., Broadcasting 5:00 to about midnight daily, also morning and afternoon programs.

KEJK, Macmillan Petroleum Corp., Broadcasting 9:00 to 1:00 a.m. daily, also morning and afternoon program.

BRAUN
ABSORPTION PLANTS



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The Preparation and Burning as Fuel Of Heavy Oil Acid Sludge

By Harold G. Osborn* and Lloyd L. Davis**

Read at American Petroleum Institute Meeting, Chicago, Dec. 3-6, 1928

In this article a satisfactory method is outlined for the profitable utilization of cylinder stock acid sludge.

The sludge is separated into weak acid, fuel oil and solid sludge or coke.

The weak acid is concentrated for re-use, while the fuel oil is burned in an ordinary fuel system.

The new Duncan rotary sludge burner is described, which will successfully handle a wide variety of waste materials which have heretofore been a total loss to the refiner.

THE recently reported[1] method of separating acid sludges under high temperatures and pressures cannot be used with cylinder stock sludges because under those conditions, the sludge is "coked" completely to a solid nonfusible mass heavier than the separated acid and cannot be drawn from the separator.

Our cylinder stock operation consists of treating approximately 2000 barrels raw stock daily. Thousand barrel agitators are used, the oil charge being 850 barrels. The amount of acid used depends upon the tar content of the raw oil and upon the color desired. This operation results in the daily production of approximately 100 tons of acid sludge, which is termed "green sludge" as it still contains sufficient oil to give it a green cast.

The green sludge is separated in lead lined open cooking kettles. The success of our cylinder stock sludge separation depends, first, upon the use of light oil acid sludge with water to give a weak acid of sufficient gravity to float the green sludge at the start of the separation; and, second, upon the use of sufficient acid oil from a previous treat, along with some fresh slop oil or gas oil, to extract the oil content of the sludge.

The light oil sludge is that resulting from the treating of Dubbs pressure distillate and is about 45 degrees Be. gravity (heavy) and contains about 58 per cent sulfuric acid. The solvent oil used may be any oil having a gravity sufficiently high to obtain separation.

The steps in the separation of the cylinder stock sludge are:

First:

One hundred twenty barrels of acid oil or "top" oil are left in the kettle from the previous run, to act as a solvent to thin the heavy green sludge as it is drawn into the kettle.

Second:

Thirty-five barrels of light oil sludge are charged to the kettle.

Third:

About 100 barrels of hot water are added, the quantity being sufficient to separate the light oil sludge into a weak acid of 24 Be. (heavy) gravity which is heavy enough to float the green sludge. This step completes the preparation of the kettle for the receipt of the green sludge. The preliminary steps require about one hour.

Fourth:

The green sludge is then gravitated from the agitator into the kettle. A batch uses 235 barrels of sludge. The draw takes about two hours, and during this period, live steam is used in the kettle to agitate and heat the mass.

Fifth:

About 175 barrels of solvent oil are then pumped in, about one hour being required.

Sixth:

An additional 85 barrels of hot water are added over a period of one hour. During all of this time the kettle is cooking with steam, the total cooking time being four to four and one-half hours.

Seventh:

After the final water is added, the steam is cut off and the contents of the kettle allowed to settle for three hours. Three layers are formed, a bottom layer of about 150 barrels of 24 degrees Be. acid, a middle layer of so-called "wet sludge" and a top layer of about 400 barrels of top oil. The acid layer is drawn off.

Eighth:

The kettle is again cooked up with live steam, the contents being thoroughly agitated for 10 minutes. The mass is allowed to settle for 1½ hours and a second acid draw is made, 70 to 90 barrels being obtained. If the separation is not good, several recookings may be necessary.

Ninth:

With all the weak acid separated and drawn, the middle "wet sludge" layer is drawn to the acid pit where the remaining weak acid can drain off.

Tenth:

About 285 barrels of top oil are pumped out, leaving 120 barrels in for the next run.

A typical run on a cylinder stock sludge kettle is outlined in Table No. 1, giving the actual acid and oil recovered.

The weak acid is concentrated in a vacuum evaporator system, to 63-64.5 degrees Be. This is blended with purchased fuming acid (104% H_2SO_4) to make 93.5 per cent acid.

The fuel oil, or top oil, containing

*Marland Refining Co.

**Marland Refining Co.

[1] J. B. Rather—A. I. M. M. E.—Pet. Tech. in 1927—Page 554.

TABLE No. 1

Kettle No. 2 — Batch No. 300

Charge	Bbls.	Gravity	Acid Content
Top Oil	120	21.5 A. P. I.	
Light Oil Sludge	35	50.1 Be.	12,460 lb.
Green Sludge	230		19,848 lb.
Solvent Oil	175		
Water	185		
Total Acid in Charge			32,309 lb.
Recovered			
1st Weak Acid	147	24.5 Be.	17,520 lb.
2nd Weak Acid	77	24.5 Be.	9,310 lb.
Total Acid Reclaimed			26,830 lb.
Per cent Acid Reclaimed			83%
Wet Sludge	111 (6.4% acid)		2,675 lb.
Fuel Oil	285	21.7 A. P. I.	180 lb.
Top Oil (left in)	120	21.7 gr. A. P. I.	
Total Acid Accounted for			29,685 lb.
Per cent Acid Accounted for			92%

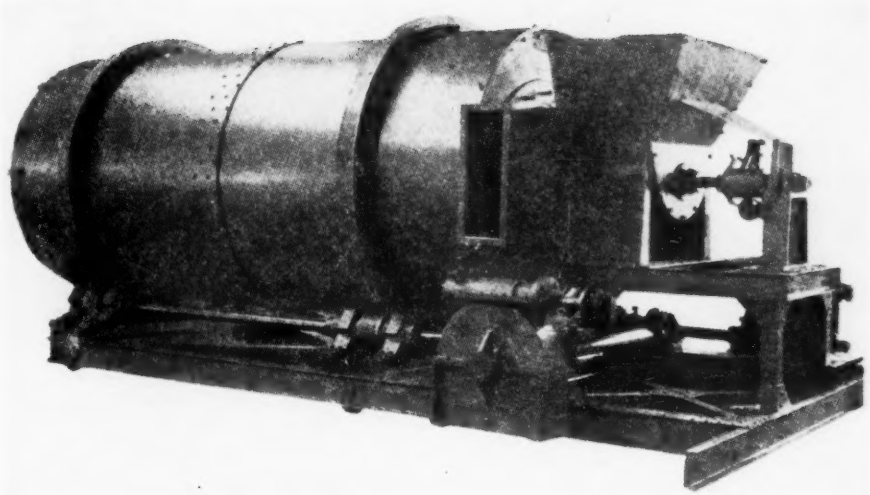


Fig. 1—General view of the burner proper, showing the worm gear drive, feed hopper and the forced draft air inlet

only 0.5 per cent acid is burned in the regular pressure circulating fuel oil system, and presents no unusual difficulties if proper precautions are taken against corrosion.

The wet sludge or acid "coke" as drawn from the kettle at 200 degrees Fahr. is a plastic mass which can be handled readily while hot. At 150 degrees Fahr. it sets to a solid, and after once cooling and setting does not soften on re-heating. It may contain as high as 40 per cent water and acid, and varying amounts of oil, depending upon the completeness of the separation. A typical sample shows only 33 per cent soluble in ether or benzol.

The wet sludge was formerly hauled to a sludge storage pond, but for the past four months has been burned at the boiler house in a Duncan rotary sludge burner. This burner has successfully handled green sludge directly from the agitators, wet sludge from the cooking kettles, and dry sludge dug out of the old sludge pond.

The Duncan rotary burner[3] has been developed over the past two years by W. M. Duncan[4] and is designed to handle any type of waste fuel from petroleum refineries, benzol plants or any similar industry. The first three burners developed were of 500, 1500 and 3000-pound per hour capacity and were installed in refineries located in Illinois. During the early development period many mechanical and operating difficulties were encountered.

These were largely in connection with the handling and feeding of the fuel and have been overcome. At the present time the burner may be considered a satisfactory commercial unit. During the past six months two Mid-Continent refiners have installed these burners for handling cylinder stock acid sludge. The first burner installed at Ponca City was designed for 4000 pounds wet sludge per hour and has easily handled half our production of wet sludge. A second burner is now being installed to handle the remainder of our current production.

[3]L. L. Davis—A. I. M. M. E.—Pet Tech. In 1927—Page 564.
[4]Illinois Stoker Co., Alton, Ill.

Description of Burner

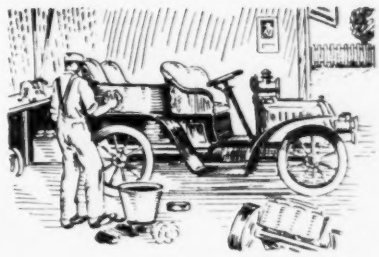
The rotary sludge burner proper, as shown in the illustrations, is basically a small rotary kiln, mounted in a horizontal position and rotated by means of a motor drive through two pairs of trunnions. The burner in question, has a ½-inch thick steel shell 6 feet in diameter and 15 feet long. The shell is lined with 6 inches of cupola fire brick throughout. The speed of rotation is 20 revolutions per hour.

The rear end is equipped with a fuel hopper and a variable speed screw conveyor, which feeds the fuel into the kiln at the desired rate. The shaft of the screw is hollow and functions as a fuel gas burner, for preheating the kiln and to insure immediate ignition of the heavy fuel. The forward end of the burner is restricted in size to hold the solid fuel in the kiln until entirely consumed.

All parts of the burner coming in contact with the acid fuel, such as the hopper and screw conveyor, are made of a special cast iron to withstand the corrosion of the weak acid carried with the sludge.

The fuel may be solid, plastic, semifluid, liquid or any mixture. It is fed through the screw conveyor and falls onto the incandescent fuel bed or burner lining where it almost instantly ignites. The volatile portions are vaporized and burned as gases and vapors in the early part of the cycle, and the residue is coked. The rotation of the burner keeps the fuel mass agitated, continually bringing fresh fuel against the heated lining where it is cracked to gas and coke.

When burning plastic or semifluid material, the fuel softens and tends to remain in mass on the bottom of the burner. High pressure jets of air or



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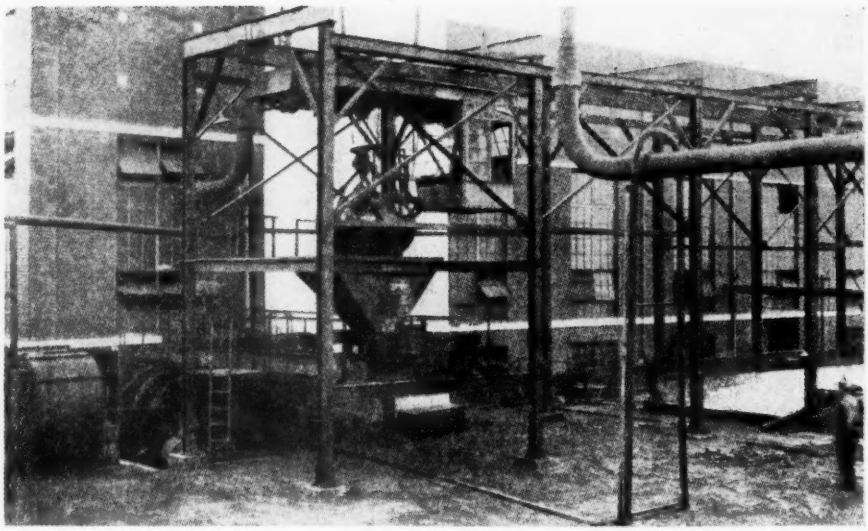


Fig. 2—General view of the sludge handling equipment, showing the monorail crane, clam shell bucket, storage hopper and drag chain conveyor

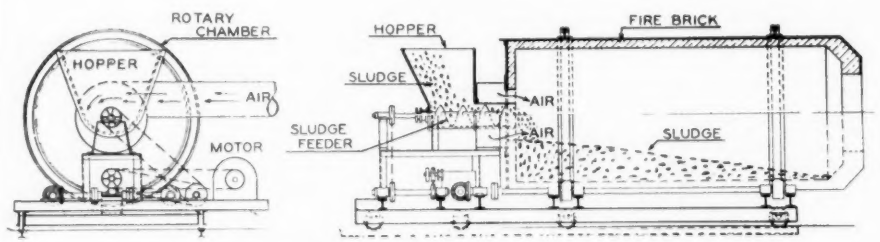
steam are directed against the plastic mass to agitate it until such time as the fuel is cracked to gas and coke by the heat of the kiln walls. Experience has shown that steam functions equally as well as compressed air for this purpose.

Air from a forced draft fan is admitted around the screw conveyor, and passes through a series of vanes which give it a rotary motion. This causes the air to hug the inside of the burner in such a way as to be brought in close contact with the fuel bed and any liquid fuel which may be carried up on the sides of the burner. The air admitted to the upper part of the burner supports the combustion of the gases. Tuyeres located below the fuel line furnish air for the combustion of the solids.

The rotation of the burner rolls the fuel mass over and over, advances it toward the front of the burner and breaks up the coke. The forced draft picks up the small coke particles and ash and carries them into the boiler combustion space.

Sufficient primary air may be used to practically complete the combustion, or if preferred, the burner can be operated as a gas producer and secondary air used in the furnace proper to complete the combustion.

The wet sludge is picked up from the storage pit by means of a mono-



SLUDGE BURNER

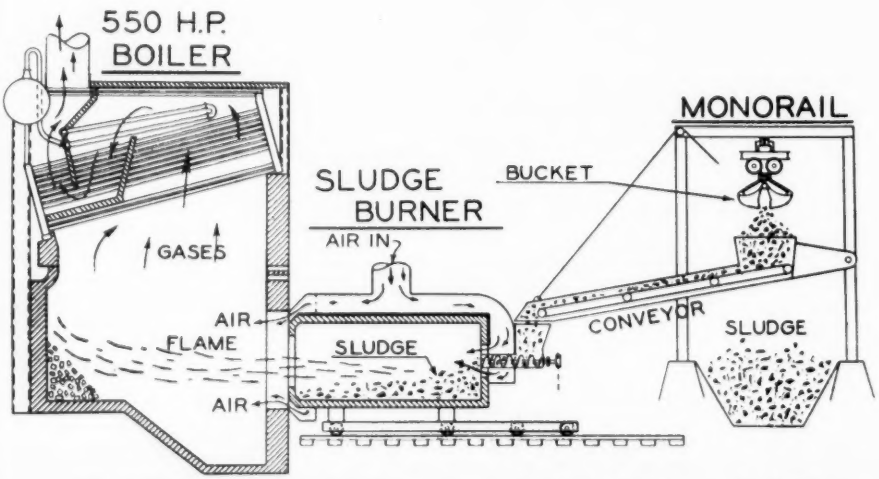


Fig. 3—Cross section diagram of burner proper, showing its hookup with the boiler

rail crane and clam-shell bucket, and is charged into a storage hopper located directly behind the burner. A variable speed, cast iron drag chain conveyor breaks the sludge into small lumps and conveys it from the storage hopper to the small feed hopper on the burner proper. The conveyor is controlled by a variable speed motor at such a rate as to keep the feed hopper about half full of fuel.

The sludge is charged from the feed hopper into the burner by means of the screw conveyor at such a rate as is required to hold the desired rating. Sufficient gas is burned at all times to insure ignition of the heavy fuel. This usually requires about 6000 cubic feet per hour.

Operation of Burner

The 4000-pound per hour burner is installed on a 550-horsepower boiler and no difficulty is encountered in carrying a 200 per cent rating. Due to the nonuniformity of the fuel, it is somewhat difficult to maintain close regulation on the boiler, but this irregularity is easily taken care of by the other gas or oil fired boilers. Considering the poor quality of the fuel and its nonuniformity, surprisingly good combustion is obtained.

When burning dry hard sludge from the storage pond practically no smoke is produced, but when burning wet or "green" sludge, a slight smoke haze is visible.

The reproduction of a typical day's chart from the Bailey boiler meter shows the regulation obtained. The inner line records the flue gas temperature, showing a variation of from 540 degrees to 580 degrees Fahr.

The results of two 24-hour test runs are shown in Table II. The first run was made on separated "coke" direct from the cooking kettles, while the second run was made on "green" sludge from the agitator.

TABLE NO. 2

Summary of Two 24-Hour Test Runs

	Separated sludge from kettle	Green sludge from agitator
Size of burner	6' x 15'	6' x 15'
Boiler—550 h. p.		
Average total rating	203%	199%
Rating due to gas pilot	39%	40%
Net rating due to sludge	164%	159%
Pounds steam from sludge per day	673,607	653,070
Net B.t.u./lb. steam	1,067	1,067
M. B.t.u. in steam from sludge/day	718,739	693,560
B.t.u. per lb. dry sludge	12,500	13,000
Pounds dry sludge per day	82,000	74,600
Evaporation per lb. dry		
M. B.t.u. from sludge	1,025,000	969,800
sludge	8.2 lb.	8.7 lb.
Per cent efficiency	70.2%	71.6%
Tons dry sludge burned per day	41.0	37.3
Per cent water and acid in sludge	40%	20%
Tons wet sludge burned per day	68.3	46.6
Pounds wet sludge burned per hour	5,692	3,884
Flue gas temperature	587°F.	570°F.
CO_2	11.0%	10.5%
O_2	6.0	7.0
Per cent air	140	144
Air temperature	90	90
Furnace draft	0.09	0.09

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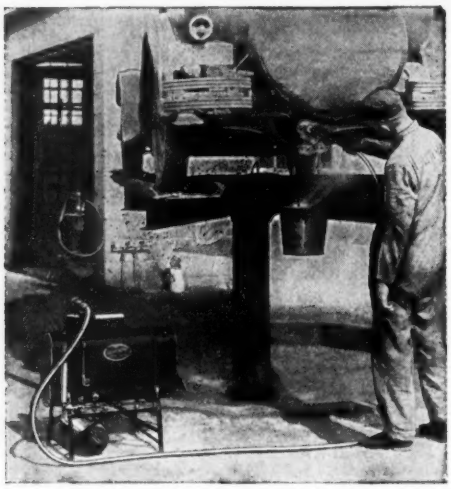

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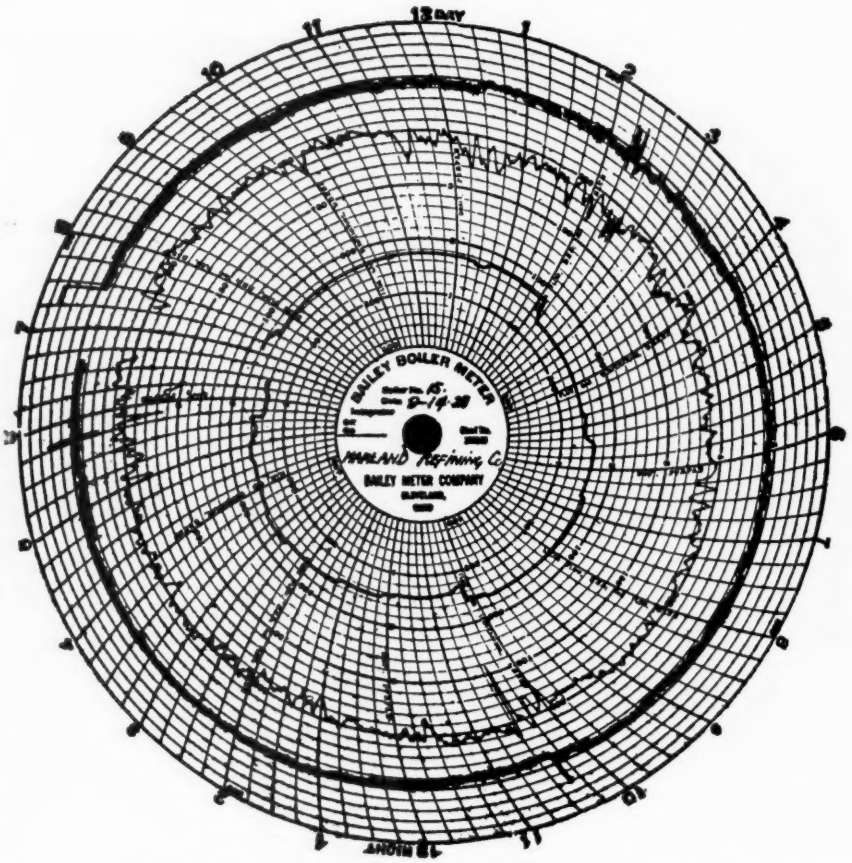

Fig. 4—Typical chart from Bailey boiler meter from boiler fired with wet sludge. The inner line shows the flue gas temperatures; the second line gives the rating on the boiler in per cent and the third, or outer line, represents the air flow and reads in per cent. The sharp surges at 2 p. m. and 10 p. m. and 6 a. m. were caused by blowing soot

Per cent hydrogen in fuel	8%	10%
Pilot flame gas cu. ft/hr.	6,660	6,720
B.t.u. per lb. gas	21,000	21,000
B.t.u. per lb. combined fuel	14,000	14,600
Lb. air per lb. fuel	13.00	13.00
Lb. dry flue gas formed per lb. fuel	13.28	13.1
Total dry flue gas per lb. fuel	18.48	18.8
Lb. water formed per lb. fuel	.72	0.9
Total wet flue gas per lb. fuel	1.12	1.1
	B.t.u. = %	B.t.u. = %
B.t.u. per lb. combined fuel	14,200 = 100	14,600 = 100
B.t.u. loss in dry flue gas	2,210 = 15.6	2,160 = 14.8
B.t.u. loss in wet flue gas	1,420 = 10.0	1,390 = 9.5
B.t.u. loss radiation & miscl.	500 = 4.2	500 = 4.1
B.t.u. to steam = eff	9,970 = 70.2	10,450 = 71.6

The past four months' operation has served to bring out the weak points in the design and construction of the present burner and may be used as a basis to forecast future performance. The most serious trouble which has developed is the question of the corrosion of the feeding mechanism by the weak acid. The screw conveyor was attacked very rapidly and this has been minimized by greatly increasing the thickness of the cast iron vanes on the conveyor and re-designing the equipment to permit rapid and easy replacement of the parts. The best solution to this problem is the thorough drainage of all weak acid from the sludge before burning.

Some trouble was had with the front wall of the boiler against which the flame from the burner played. The very high temperature and velocity of the flame quickly fluxed the front wall in which a standby gas burner was installed. This difficulty was overcome by reconstructing the wall with high temperature brick and building the gas burner of tile in such a way as to permit the burner tips being withdrawn from the setting when not in use. This experience has shown that a very high setting, at least 18 ft. for this size boiler, or a large dutch oven is desirable for a burner of this type.

One operating difficulty is worth mentioning and that is the building up of a solid coke ring inside the burner which prevented the proper feeding and burning of the fuel. This was found to be caused by an improper ratio of fuel rate, pilot flame gas and agitating steam; when these conditions are right, no coke rings are formed.

NEW YORK, Nov. 30.—"World Prices of Gasoline, Kerosene, Diesel Oil, Fuel Oil and Bunker Coal" is the title of a booklet issued by the American Petroleum Institute, which is published as an expanded form of the quarterly special circular formerly issued by the petroleum section of the minerals division as "World Retail Gasoline and Kerosene Prices."

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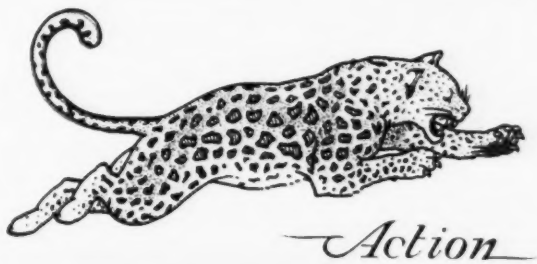

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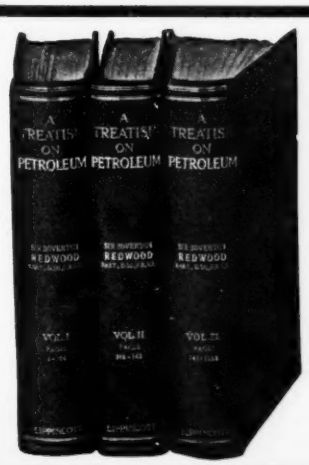

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The Formation of Acetic Acid in Heat And Pressure Cracking

By F. W. Hall* and R. deM. Taveau*

Read before American Petroleum Institute Meeting, Chicago, Dec. 3-6, 1928

AS EARLY as 1920 it was noted that water extracts of distillates made by pressure cracking at times possessed an acetic acid odor. It was also noticed that no matter how dry the pressure still charging stock, some water invariably came over with the distillate. It was also about this time that serious corrosion trouble in our pressure stills was first experienced.

In order to more carefully study this corrosion, its possible causes and remedies, considerable work was done to see whether there existed any relationship between organic acidity of the charge oil and its corrosiveness.

Samples of various iron and steel stocks were suspended in both the oil and vapor spaces of a pressure still for careful observation and weight losses noted after each run. The possibility of electrolytic effects was eliminated by carefully insulating the samples from the still and from each other by porcelain insulators.

The corrosiveness of organic sulfur compounds of course was well known and even today our foremost oil chemists are inclined to blame sulfur for all their corrosion troubles. There were certain facts that indicated possible corrosion from other sources. The charge going to the stills was acid, the distillate was usually neutral but sometimes acid and the pressure bottoms were practically neutral. It was obvious, therefore, that the acids in the charge were either neutralized or destroyed in the cracking reaction.

In order to find the source of these acids and their characteristics, samples of gas oils from the following sources were obtained and acidity tests made with the following results:

Vinton crude Trace Naphthenic Acids Mol. Wt. 258.

W. Columbia crude .606 per cent Naphthenic Acids Mol. Wt. 258.

N.C. Texas crude .055 per cent Naphthenic Acids Mol. Wt. 258.

Humble crude .660 per cent Naphthenic Acids Mol. Wt. 258.

Mexican crude .720 per cent Naphthenic Acids Mol. Wt. 258.

In order to study the possible formation of fatty acids from the naphthenic acids originally present in the charging stock, Humble gas oil was selected. The method was to saponify with strong caustic solution and to wash out the acids. In the beginning difficult emulsions were formed, but trouble from this source was soon eliminated.

SULFUR and its compounds and hydrochloric acid are the defendants named in most of the indictments drawn by petroleum technologists charging corrosion of tanks and refinery equipment from the storage or processing of crude oil.

This paper throws suspicion on other possible accomplices of the agents mentioned. These are acetic acid and others of the lower fatty acids which it seems to the authors may be formed from the naphthenic acids in the oil during the cracking reaction.

The crude acids obtained on acidification of the soap solution were further refined by resaponification with caustic dissolved in 50-50 alcohol-water. The final product had a molecular weight of 370, assuming all acids monobasic.

It was our assumption that if water and acetic or other fatty acids were formed in the cracking reaction, and the water was not originally present in the charge in sufficient quantity, that the oxygen must be supplied by the charging stock itself and therefore the water must come from the decomposition of the acids themselves.

A quantity of the naphthenic acids were placed in a small "cracking" still equipped with an air reflux condenser. The material was brought up to 815 degrees F. slowly. The pressure correspondingly increased to 225 pounds per inch. By means of a valve the pressure was maintained at 200 pounds per square inch for 4½ hours when the reaction was considered complete. It was found that an aqueous extract of the material remaining in the chamber contained considerable iron. The iron was precipitated by making the solutions alkaline and the iron removed by filtration.

The solution was then concentrated on the hot plate, made acid with strong sulfuric acid and esterified with ethyl alcohol. The odor of ethyl acetate was plainly detected. However, there were other esters formed at the same time. It certainly seems possible therefore that lower fatty acids may be produced from naphthenic acids in the cracking reaction.

All of this work was done between July and December, 1921, and dropped when the experimenter was assigned to other duties. We were pretty well convinced that fatty acids were responsible for some portion of the corrosion troubles. This is borne out by experiences with aluminum bubble caps which should show excellent resistance to sulfide corrosion, but which according to our experience are rapidly corroded, indicating presence of the lower fatty acids, especially formic.

The matter was again brought to our attention during 1927 when difficulty was encountered in revivifying soda ash solution in our Koppers gas purification system. An investigation led to the conclusion that the presence of organic acids in the solution was responsible for the trouble we were experiencing. Unquestionably these acids came over with the water usually present in the distillates.

We have observed that recycle stocks yield a much lower percentage of water and less acid than in the case of a straight virgin gas oil. In the work we have recently done therefore, we have chosen the water which yields the highest quantity of acids. The water solution tested covered the average production for 12 days.

The method used in separating the acids was like that used in the wood distillation industry for the recovery of acetic acid from pyroligneous liquor. An excess of calcium hydroxide was added to the acid water, which was then concentrated to a thick paste on a steam bath, and finally dried in an electric oven at 105 degrees F. The solids there obtained were placed in a round bottom flask, fitted with a thistle tube, to admit sulfuric acid and connected to a water cooled condenser. Concentrated sulfuric acid was admitted through the thistle tube very slowly, but in spite of this, considerable uncondensable gas was evolved, having a sharp odor. Sufficient sulfuric acid was finally added to entirely cover

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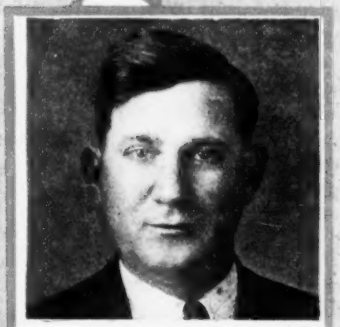

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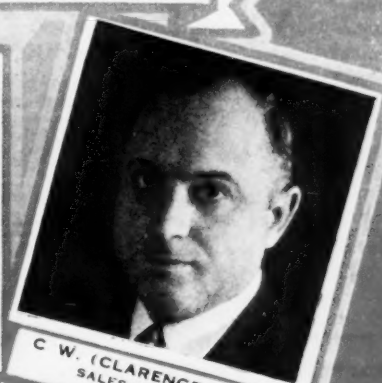

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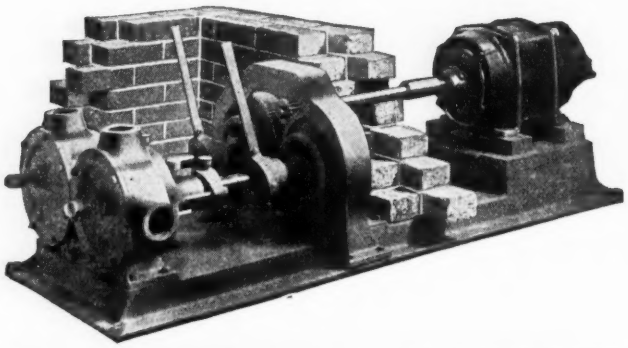

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the solids. Heat was then applied and the volatile acids distilled off. Toward the latter part of the distillation a film of sulfur was deposited on the wall of the condenser tube. The distillate which was murky, due to colloidal sulfur, had an acetic acid-like odor, a specific gravity of 1.051, which corresponds to about 40 per cent acetic acid. The amount of acetic acid calculated from the volume collected and percentage shown by specific gravity, was about 1.54 per cent of the acid water produced in the cracking operation. A mean concentration as determined by actual analysis for the 12-day period was 1.75 per cent calculated as acetic acid.

The result of this work seemed promising enough so that it was deemed advisable to continue, especially with the volatile acid analysis of daily samples of water and the determination of the various organic acid constituents.

The percentages of volatile acids (in terms of acetic acid) over a period of 45 days varied from 0.85 per cent to 1.98 per cent for virgin cracking stocks with an average of 1.45 per cent. For a period of ten days recycle stocks varied from 0.45 to 1.90 per cent with an average of 1.20 per cent.

A sample of the volatile acids from a composite of the above acid water was analyzed for percentage of components. Its properties were as follows:

Odor	Acetic acid
Spec. gravity	1.0605 @ 15° C.
Hydrochloric acid	3.25%
Sulfuric acid	Trace
Nitric acid	None
Hydrocyanic acid	None
Sulfurous acid	None
Phenols	None
Non-volatile	.033%
Formic acid	.054
Acetic acid	27.57
Proprionic acid	20.13
Butyric acid	8.47
Total Org. acids	56.27

The calcium hydroxide used in preparing the above acids had a chloride content of 0.01 per cent. This therefore is unquestionably responsible for the presence of hydrochloric acid in the above acids.

The low percentage of formic acid present is not a true measure of the quantity which is formed in the reaction since the method of recovery of the acids would naturally eliminate much of the formic acid as carbon monoxide and water.

We have not considered the commercial aspects of these various organic acids, but the further work which we have in mind will follow along the lines of developing which crudes are responsible for the production of these acids. Much of this can be done by "cracking" pressure still charging stocks from various sources under varying conditions. Undoubtedly some interesting information will be obtained.

Economic Aspect of the Marketing Of Natural Gasoline By-Products

By R. C. Alden*

Presented before American Petroleum Institute, Chicago, Dec. 4-6

NEW products from natural gasoline and new markets for existing products, and their economic effect on the entire oil industry, are discussed in the accompanying paper prepared by R. C. Alden, of the Phillips Petroleum Co. His company has done considerable experimental and research work to develop both new products and new markets.

He estimates that the amount of liquefied petroleum gas contained in the natural gas produced in this country would amount to 18,000,000 gallons a day, a quantity more than sufficient to supply twice the heating value of manufactured gas consumed.

Not all this volume could be recovered, of course, he says; but he does point to a source of additional supplies of this at present most marketable by-product of the natural gasoline industry, from uncondensed vapors at refineries, particularly cracking plants.

EVERY activity of every branch of the oil industry has its effect, great or small, on every other branch of the oil industry.

Increased efficiency in any aspect of finding, storing, transporting, refining, marketing or using petroleum and its products means a measure of readjustment throughout the entire industry. Admittedly the overwhelming factor has been the volume of crude oil production, but the oil industry is rapidly realizing that benefit or harm to one of its many ramifications is likewise beneficial or harmful to its entire structure.

Thus it is a matter of interest to the oil industry as a whole to learn that progressive representatives of the natural gasoline industry are strenuously opening new markets for certain products available as an incident to the manufacture of the more stable grades of natural gasoline.

It is true some of these markets are competitive with other products from petroleum, and as such will merely result in a readjustment within the industry providing economic conditions justify a change. However, some of the new markets are in fields comparatively unexploited from a petroleum viewpoint and therefore represent means of increasing the total revenue of the oil industry.

The major function of the oil industry has been to provide fuels which can be conveniently and cheaply utilized in supplying mankind with light, heat and power. The magnitude of our resources has made petroleum a cheap fuel supply. The liquid nature of the products of petroleum has made it convenient to store, transport and use them. Liquid fuels from petroleum have generally found markets commensurate with their value while the gaseous products have been marketed at prices entirely out of line with prices for gaseous fuels from other sources.

Natural gas, a major product of the oil industry, is produced in large quantities but has difficulty in finding markets commensurate with its value. Natural gas is usually produced in districts remote from points of consumption. It cannot be stored and can only find markets through long and expensive pipe lines.

It has not been long since casinghead gas was a nuisance and the encountering of gas where oil was expected meant financial failure. Today the gas revenue to oil producing companies forms a considerable portion of the total revenue and not infrequently gas wells are more profitable than oil wells. This is due, of course, to the extraction of natural gasoline and the greatly improved facilities for distribution of natural gas. It is to be expected that diversified markets for the natural gasoline industry will further add to the revenue of the oil industry.

In finding markets for liquefied petroleum gas, the natural gasoline industry is taking advantage of the natural economic benefits possessed by liquid fuels as far as storage, transportation and handling is concerned; and yet is supplying a material which has all the advantages of gaseous fuel in its use. In so doing, markets new and old to the petroleum industry are being solicited. Obviously this will have some effect upon all branches of the oil industry.

Although the subject of this paper is to discuss the relationship of liquefied petroleum gas to the oil industry a clear understanding of its exact status should include a short discussion of some of the uses to which the commodity has already been put. These uses can be briefly summarized as follows:[1]

Uses for Liquefied Gas

"1. *Domestic Fuel* transported in cylinders, thus supplying gas to districts not now having that service. This use is a valuable ally to the gas companies as outlying districts can be serviced and held against encroachment by electricity or other fuels, pending gas main extensions. Commercial propane, being self vaporizing at all temperatures above minus 40°F. is the most applicable and most widely used fuel for this 'bottled gas' service.

"2. *Industrial Gas* for various heating operations when the fuel consumption is large and where an economical but clean and easily controlled fuel is necessary. This phase of utilization, unless the marketing is controlled by the utilities themselves, is in direct competition with the industrial fuel sales efforts of the gas companies. Commercial butanes are best adapted to this exacting large-scale use.

"3. *Enricher for Manufactured Gas*, in place of gas oil to carburet producer gas, blue water gas or other gases of relatively low-thermal value to the required calorific standard. The efficiency of 'cold carburetion' is 100 per cent. Commercial butanes are most applicable here, due to their favorable physical characteristics.

"4. *Base Material for Manufactured Gas.*

"a. Carburetting gases of little or no calorific value, these acting as diluents or carrying mediums. Exhaust or flue gases, or air are the materials commonly used.

"b. Reforming or cracking high calorific value liquefied petroleum

*Phillips Petroleum Co.

[1]R. W. Thomas and O. M. Setrum "Commercial Propane and Butanes in the Manufactured Gas Industry"—1928 A. G. A. Convention.

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gas vapors to produce low-density gaseous fuel of the desired B.t.u. content.

Although the use of any of the standard grades is practical for either of the above operations, nevertheless, the commercial butanes offer outstanding advantages and economies.

"5. *Commercial Solvents.*

"6. *Raw Materials for the Manufacture of Chemical Compounds.*"

At the present time natural gas is the major source of liquefied petroleum gas. The average composition of natural gas at the well is estimated to be about: Methane 69%; ethane 14%; propane 9%; butane 5%; pentanes and heavier 3%.

Methane and ethane are eliminated from the province of liquefied petroleum gases by their physical characteristics. Atmospheric temperatures are considerably above the critical temperature of methane, while the critical temperature of ethane is about 90°F. Propane and the butanes are the chief constituents of liquefied petroleum gas. The following table shows the vapor pressures of the paraffin hydrocarbons of which liquefied petroleum gas is composed.

Table 1—Vapor Pressure (Lb. per Sq. In.) of Propane, Iso-Butane and Pentane

	—50°F.	0°F.	50°F.	100°F.	150°F.
Propane	12.63	38.05	91.00	186.4	343.0
Iso-butane	3.21	11.67	32.30	74.0	144.2
Butane	1.86	7.35	21.55	52.5	107.5

The boiling points of propane, isobutane, and butane are —47, 16 and 31°F. respectively. It is evident that these hydrocarbons possess physical characteristics which bring their liquid state within the economics of modern engineering.

18,000,000 Gallons Daily Supply

It is estimated that the production of natural gas in the United States contains propane and butanes in sufficient quantity to supply twice the heating value of the country's consumption of manufactured gas. This amount of liquefied petroleum gas would be eighteen million gallons per day.

This large supply of liquefied petroleum gas is not immediately available. To begin with, the design and operation of the average natural gasoline plant is such that of the gas processed about one-half of the available butane and one-eighth of the available propane are removed. However, it is a comparatively cheap and simple procedure to increase the quantities removed.

Another consideration affecting the availability of liquefied petroleum gas is that butanes are normally included in large proportions in natural gasoline. It is estimated that the average natural gasoline contains about 28 per cent butanes and lighter. From this viewpoint, the marketing of butane will be an economic struggle between the motor fuel markets and the new markets developed.

A final consideration in regard to the availability of liquefied petroleum gas from natural gas is that its production is naturally more economically accomplished at large natural gasoline plants. It is too early to state what volume of production is essential to profitable operation but there is a strong possibility that the smaller gasoline plants will find it uneconomic to manufacture liquefied petroleum gas.

Another considerable source of liquefied petroleum gas is the uncondensed vapors at refineries, and particularly at those refineries where cracking plants are in operation. It is noteworthy in this regard that many gasolines produced as a result of cracking operations contain relatively large proportions of extremely light hydrocarbons as is evidenced by their unduly large Engler distillation losses and low Engler initial boiling points. Such gasolines will find disfavor with the motoring public due to vapor locking troubles and make it difficult for automotive designers to adapt gasoline feed systems to the conventional Engler 90 per cent point. The development of vapor phase cracking will also enlarge the supply of liquefied petroleum gases, since one of the pressing problems in this field is the disposition of the large proportion of uncondensed vapors produced.

From the foregoing it is obvious that the supply of liquefied petroleum gas is adequate for the development of large markets. As the present resources of the natural gasoline industry are utilized, further reserves in the natural gas can be called into the markets. Refinery vapors can also furnish their share toward satisfying such markets as are developed.

A brief review of the economic history of the natural gasoline industry will serve to show the reasons why the development of markets for liquefied petroleum gas is being undertaken principally by this branch of the oil industry. The past history of the natural gasoline industry can be divided roughly into two parts.

Early Natural Gasoline Operations

During the earlier period, cheap blending material was available which permitted blending at gasoline plants. Under these conditions very volatile condensates were included in the finished blends. Practically all the butane extracted and, it is safe to say, large proportions of the propane removed from the natural gas were sold as a part of motor fuels. Frequently the manufacturer made more profit by selling low priced naphtha at high motor fuel prices than in operating his gasoline plant. There was little market for natural gasoline as such, and the manufacturer sold the finished blends in competition wih the refiners, who sold him the blending materials. There were no definite specifications for natural gasoline and very little attention to a definition for good motor fuels.

Due to the increasing demand for

gasoline, the cost of naphtha for natural gasoline plant blending finally increased to prohibitive levels. This change marked the beginning of a new period. Events which followed or accompanied this economic transition were the establishment of definite specifications for motor gasoline and the rapid development of the oil absorption process. Eventually natural gasoline became a distinct commodity, bought and sold under standard specifications. The principal purchaser of natural gasoline became the refinery and the product had to be shipped unblended. Obviously there was established a much lower limit to the proportions of butane and propane which finished natural gasoline could contain.

Thus we find conditions ideal for the development of new products and new markets. The natural gasoline industry has available large quantities of material, formerly marketed at a profit, which have been unnecessarily wasted for several years.

Diversification of markets should have a desirable effect in somewhat stabilizing the prices for natural gasoline. The price of U. S. Motor fluctuates more than is desirable but the price obtained for natural gasoline varies even more. This is an unhealthy condition. In times of high prices the manufacturer is tempted to make expenditures not justified by average business conditions, while in times of low prices he is compelled to economize beyond the limits of progressive policies.

Practically all the liquefied petroleum gas being marketed today is derived from natural gasoline itself. In other words, the liquefied petroleum gas components are separated from the natural gasoline condensate and marketed. The residual natural gasoline is a very stable product which can be marketed as aviation gasoline or as a superior motor gasoline. This practice will undoubtedly continue until an economic balance has been reached between the demand for liquefied petroleum gas as a component part of motor fuels and the demand for butane in the new markets.

Will Stabilize Markets

In the meantime, liquefied petroleum gas will serve as a means of stabilizing natural gasoline markets, at the same time adding to the total revenue of the oil industry.

The relation of the liquefied petroleum gas industry to the refining industry is indeed a complicated one. The facts that refinery vapors are a source of liquefied petroleum gas and that liquefied petroleum gas markets may materially aid in promoting the progress of vapor phase cracking have already been mentioned. On the other hand, liquefied petroleum gas in many of its uses is a direct competitor of fuel oil in industrial uses and of gasoline and kerosene in domestic uses. Furthermore, extended markets for liquefied petroleum gas will bring the refiner into competition with other purchasers for this portion of natural gasoline.

In regard to refinery vapors as a source of liquefied petroleum gas, the following is an analysis of the uncondensed vapors at one refinery: Methane and air 11.3; ethane and CO, 7.4; propane 28.5; butane 31.7; pentanes and heavier 21.1.

The refinery in which these vapors were encountered produces a gasoline containing 1.1 per cent propane and 5.5 per cent butane on the liquid volume basis. The Engler distillation recovery of the gasoline produced runs as low as 95 per cent.

An investigation which included the composition analysis of more than 100 filling station samples of commercial gasoline showed the results outlined in Table 2 in regard to propane and butane content of motor gasoline.

Table 2—Propane and Butanes Contents of Gasolines
(Liquid Volume Per Cent)

	Propane and Lighter	Butanes
Average of more than 100 filling station samples..	0.4	4.0
Extreme maximums above sample	1.3	9.8
Estimated for natural gasoline	1.5	26.5
Estimated in average motor fuel, contributed by natural gasoline	0.2	2.7

Taking into consideration handling losses between the refinery and the motorist's tanks, it is apparent that gasoline as derived from petroleum contains considerable proportions of propane and butanes.

Propane in commercial gasoline is not objectionable because it is a dissolved gas or because it raises the vapor pressure unless an excessive amount is present. In some instances, propane is desirable. For instance, propane improves the starting characteristics of gasoline particularly in cold weather.

In addition a small amount of propane can have the same beneficial effect in this direction as somewhat larger amounts of butanes and considerably larger amounts of pentanes. The principal argument against the presence of propane in commercial gasoline is that, by substituting equivalent proportion of butanes or pentanes for the propane, the starting and accelerating properties of the gasoline can be improved. This is precisely what the Natural Gasoline Association is stressing in its recently adopted motor fuel specifications. Here the emphasis is placed on pentane as the constituent imparting "pep" to motor fuel.

With cracking processes incorporating too much of the extremely light hydrocarbon material in finished gasoline and with vapor-lock a serious problem in gasoline consumption, it is reasonable to believe that refiners will eventually pay quite as much attention to the fractionation of the light end of their gasoline products as i-

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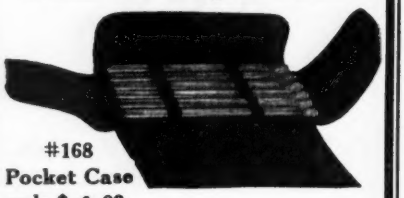

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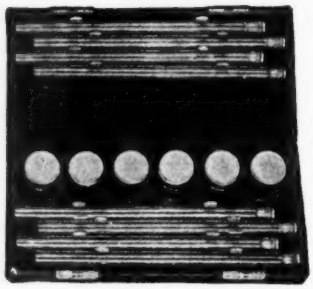

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now being paid to the fractionation of the heavy ends. Propane, butanes, pentanes, etc., will be added in controlled amounts so as to provide the best average motor fuel from the material available. The natural gasoline industry is rapidly putting its house in order for this development but the problem has received too little attention at refineries.

Additional Source of Supply

In regard to the uncondensable gas produced in vapor phase cracking and its relation to the liquefied petroleum gas industry reference is here made to Luis de Florez' talk delivered at this convention one year ago:

"The non-condensable gas produced by Vapor Phase cracking has a very high heat value as well as illuminating properties and is similar in almost all respects to the gas that is produced by gas companies to enrich water gas. It is conceivable, therefore, without much imagination, that gas companies would be willing to buy this gas from the refineries at a reasonable cost, instead of purchasing gas oil which they, in turn, must process at considerable expense and plant investment, to serve the same purpose.

"It is further conceivable that refineries, which are situated within reasonable proximity to large centers of population, could afford to operate Vapor Phase plants, selling the gas as one of the resulting products to Public Utility companies, and actually make it a source of revenue. Possibly some desultory attempts have been made to work out arrangements of this character, but if only a portion of the effort which has been devoted to the sale of refined oil had been put on the sale of gaseous products, a ready market would doubtless exist for them today. Heretofore there has been little necessity to consider this problem seriously, due to the comparatively small amount of gas formed in existing Liquid Phase plants, and it is only natural that development should await the necessity. The only apparent obstacle to the profitable sale of gas appears to be the necessity of creating a true realization of its value."

It is evident that here is one branch of the refining industry that will work hand in hand with the natural gasoline industry in developing markets for liquefied petroleum gas.

However, these are possibilities for the future. Liquefied petroleum gas as a competitor of fuel oil and as a means of stabilizing natural gasoline markets are realities of the present. In addition liquefied petroleum gas as a domestic gas popularly known as "bottled gas" will undoubtedly encroach on the present markets for gasoline and kerosene used for this purpose.

Market for "Bottled Gas" Growing

As a competitor of fuel oil liquefied petroleum gas is already making a serious bid for that portion of the market applied to the more or less exact heating operations of industry. In many heating processes the direct heat of liquefied petroleum gas can be used where muffle type furnaces are necessary with fuel oil. Liquefied petroleum gas can be used very effectively as a substitute for gas oil in the enrichment of manufactured gas.

Obviously the price basis on which liquefied petroleum gas can compete with gas and fuel oil depends entirely upon the advantages to be derived from the use of liquefied petroleum gas. As a general rule, the ease of control of combustion, the purity of the fuel, and the rapidity with which heating units are placed in operation are very decided selling points for liquefied petroleum gas. Off-setting these advantages are the increased cost of storage and the somewhat lower calorific value for liquefied petroleum gas.

Perhaps the most important aspect of the liquefied petroleum gas industry for the refiner is its influence on the natural gasoline market. Natural gasoline from which all the butane has been removed is an entirely different product from the customary commercial grades of natural gasoline. To begin with, it is an excellent aviation fuel, superior in many respects to the aviation fuel produced at refineries. This has been amply demonstrated by several natural gasoline manufacturers as a result of their own investigations and is being carefully studied by the Bureau of Standards and the Society of Automotive Engineers.

This aviation natural gasoline cannot be normally used as a fuel for automobiles, although it is an excellent winter gasoline. Slight changes in automotive design would enable its satisfactory use. However, relatively small proportions of refinery gasolines and naphthas are required in preparing superior motor fuels. It follows, therefore, that the natural gasoline industry is capable of finding direct markets for its products when the refinery market is unprofitable.

Provided markets can be created for butane, and there is every reason to believe the markets exist, the prices for natural gasoline are bound to be stabilized for several reasons. The butane markets will be competing for a portion of the natural gasoline. The supply of natural gasoline will be automatically reduced. The demand will be increased because larger proportions of the very stable gasoline will be required to impart the desired "pep" to finished motor fuels. The natural gasoline manufacturer will have a residual product with which he can go directly to the trade.

Many progressive companies are entering the liquefied petroleum gas industry. There are at least 20 different brands of "bottled gas." While many of these activities are in the

very early stages of development, the liquefied petroleum gas industry is assuming commercial importance by leaps and bounds. It is estimated the 1928 sales of liquefied petroleum gas will exceed by 100 per cent those of 1927 and that the volume of business in 1929 will be many times greater. In many fields doubting Thomases have been converted to the use of liquefied petroleum gas and these leaders will undoubtedly be followed rapidly by others in the same fields. The initial resistance to a new thing has been largely overcome in certain applications.

At the present time the principal advantages of the liquefied petroleum gas industry accrue to the natural gasoline branch because a diversity of markets and a flexibility in sales programs are made possible. This trend toward stability for the natural gasoline industry will in itself be an advantage to the entire oil industry. Over and above this, markets new to the petroleum industry are being developed which will have the effect of increasing the total revenue. In addition, the refining industry may easily become a source of liquefied petroleum gas, with vapor phase cracking depending greatly upon the new markets.

Finally, no commentary on the liquefied petroleum gas industry would be complete without mentioning that here we find a true example of conservation of our natural resources. By applying the principles of modern engineering and merchandising, the natural gasoline industry is finding it possible to divert a portion of natural gas from its customary low price field to markets where higher values prevail. History promises to repeat itself with liquefied petroleum gas playing the role formerly played by natural gas in the oil industry's everlasting problem of providing civilization with the utmost convenience and utility from the resources available.

Heil Quits Refiners Oil

CLEVELAND, Nov. 30.—R. C. Heil, formerly head of the Commercial Oil Co. here, which was acquired several months ago by the Refiners Oil Co., Dayton, severed his connection with the latter company on Nov. 30. Mr. Heil had been retained as manager of the Commercial properties at the time of the acquisition by the Refiners company.

Mr. Heil will devote his time to the Ashland County Oil Co., Ashland, and Summit Oil Co., Akron, O., of which companies he is president.

Although the plant and general offices of De La Vergne Machine Co. have moved from New York to Philadelphia, the firm still maintains a large staff at its New York branch offices, 100 Broadway, New York City, the company announces.

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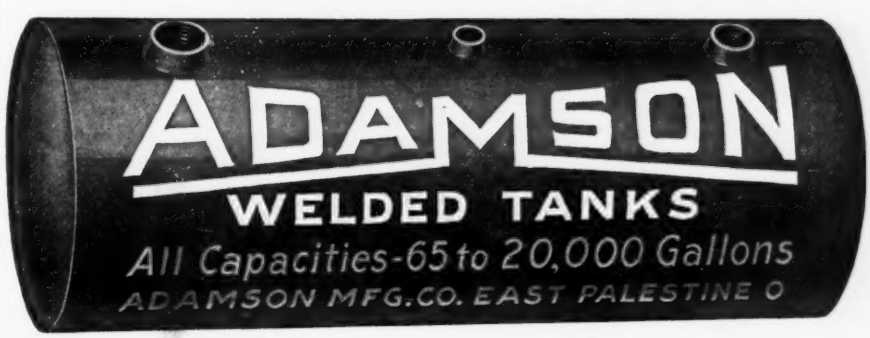

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A year and a half ago Naturaline was being introduced to pilots for the first time. There was need for a suitable Aviation fuel. Old specifications were rapidly becoming obsolete. It was then that an eminent professor famed for his study of Motor Fuel Combustion began to conduct experiments with pure Natural Gasoline. This valuable product of petroleum had been produced by the Chestnut & Smith Corporation for many years, and it was through their confidence and vision that Naturaline was released to the service of Aviation.

Naturaline is not a cut of crude oil. It is a trade product made entirely from Natural Gasoline. The name was coined and is registered in the U. S. Patent Office. It is the exclusive property of the Naturaline Company of America who inherited it from the parent Company—Chestnut & Smith Corporation. Naturaline has many times proven itself in actual flights to be superior to ordinary gasolines in quick starting, acceleration, smoothness of power out-put, economy and weight.

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Type of motor tank train used in California. This unit of the California subsidiary of The Texas Corp. is similar to that used by the Asbury Transportation Co. as described by Mr. Asbury

California Experience Reveals Motor Tank Train Possibilities

By F. H. Asbury*

Read before the American Petroleum Institute at Chicago, Dec. 3-6

WHEN our company decided to go into the business of transport hauling a study of traffic conditions was made and we endeavored to consider this phase from all angles, bearing in mind that the traveling public must be taken into consideration and every precaution used to eliminate as much as possible any inconvenience to which it might be put on account of the business in which we were about to engage.

We decided upon a type of equipment which would, in so far as practicable, reduce to a minimum the number of trucks and trailers placed upon the highway, as by so doing it would at once leave additional space to be utilized by other transportation units. Our drivers have been schooled to regulate their speed when operating in congested districts where traffic signals of any type are in use, so as to eliminate the necessity of coming to a stop at intersections. This tends to speed up the movement of the equipment, for the reason that, if it is in motion at the time of approaching the intersection, it is much easier and quicker to get out of the way of other traffic.

When operating on sections of the highway where there is heavy traffic in both directions causing a large number of faster moving vehicles to accumulate behind the transport equipment, the driver is instructed to watch for a place where he can pull off the road and stop to permit the congestion behind him to clear.

Road conditions over which transport hauling is performed on the Pacific coast are varied, although consisting in the main of paved highways. The temperature between destinations and the contour of the country vary considerably. For instance a load originating at some point in southern California, where the atmospheric temperature is around 75 degrees Fahr. and the altitude a few feet above sea level, will be transported into central California where the atmospheric temperature may be any place between 100 and 110 degrees Fahr. In traveling to its destination it is necessary to pass over several mountain ranges reaching an elevation of approximately 4,300 feet, then descending again to an altitude of around 250 feet to 500 feet.

In such a movement it is readily seen that throughout the year's operation many changes in climatic conditions will be encountered, as well as a large variation in road bed, all of which will exist within a distance of 140 miles.

A similar condition exists in transporting from what is termed the Los Angeles Basin to Imperial Valley points, a distance of about 250 miles. At point of starting you will have an altitude of a few feet above sea level as in the first instance cited, raising to an elevation of about 3,500 feet, then dropping to below sea level, with atmospheric temperature ranging from 75 to 120 degrees Fahr.

Under such conditions, contraction and expansion in the cargo must be given due consideration and ample provision made in dome capacity. In the transportation of commodities such as casinghead gasoline it is advisable to use insulation on the outside of tank equipment to reduce heat penetration.

In some instances a saving in evaporation loss has been made by using back pressure vent valves and where this is done, much care must be used to see that the pressure developed on tank equipment does not exceed its safe carrying capacity. Tanks which are described in the following paragraphs are designed in general to withstand a 20 pound hydrostatic test and when back pressure vent valves are used they are set at 4 pounds.

As intimated, after having considered all phases of vehicle traffic upon the highway we then gave thought to the construction of tank equipment, as we realized that commodities which we were to transport were of such a nature that much hazard would be created if proper precautions were not taken. This question will be dealt with at greater length on another page of this paper.

The flexibility of truck transportation makes it possible for the dis-

*Asbury Transportation Co., Los Angeles.

tributing agencies to locate their depots at the most advantageous points, as we have large numbers of communities on the Pacific coast that do not have rail transportation available, also large agricultural sections similarly situated, all of which are large consumers of petroleum products.

Super service stations having a storage capacity of 10,000 gallons or more are in a position to receive their commodities in truck and trailer load lots and may be located at any crossroads where traffic is heavy, because the transport company is able to replenish the storage upon a few hours' notice.

Again on account of the flexibility of truck transportation the investment in distributing depots can be materially decreased. I have in mind at the present time a distributing depot located 130 miles from the supply base or refinery. If the owner depended upon rail transportation he would have to have at least 30,000 gallons storage capacity as it would not be safe to permit his storage to be reduced below an average day's supply and it would require at least 20,000 gallons additional to accommodate the irregular movement which might occur from rail transportation. By using truck transportation for this operation the storage requirement is reduced to 15,000 gallons and equipment is so routed that the margin of safety is the same as though the larger storage had been installed.

This type of transportation also eliminates the necessity of installing spur tracks, thereby further reducing the first cost of distributing depot as well as the maintenance in operation.

I can call to mind several distributing depots, which are dispensing from 2,000 to 4,000 gallons of product per day, that find it possible to safeguard their distribution with a storage capacity of 10,000 gallons; two of these depots are located at a distance of 215 miles from the source of supply. I believe you will agree with me that this operation would be impossible with such a small storage, if any other method of transportation were employed.

In designing facilities for taking advantage of transport hauling due consideration should be given to the construction of loading racks and unloading racks in order to speed up the operation as every hour saved in so doing means 10 to 12 miles travel by the equipment, which in turn reduces operating cost and makes it possible to transport the commodity at a lower rate. In this connection we believe that thirty minutes is sufficient time to allow for the loading or unloading of a 5,500 gallon truck and trailer load. This can easily be done if 3-inch pipe connections with proper pumping facilities are installed. Assuming that 30 minutes can be saved on each load with the above-mentioned installation, this means also a considerable saving in handling the products at point of origin or destination, as it thereby makes the labor available for some other activity. It also means, in the event a large number of pieces of equipment are to be loaded on any particular day, that the capacity of each loading rack has been materially increased.

As before stated we have given considerable thought to construction of tanks in order to eliminate as far as possible any hazard which might have been created had we been less careful in our construction, and we have deemed it advisable to sacrifice pay load in order to construct a tank that is in keeping with our ideas of good practice. The following will give a conception of what we believe to be good practice in construction of tanks for transport hauling:

The outside shell of the tank is constructed of No. 7 U. S. Standard gauge open hearth flange steel, having lap joints, spot-riveted and welded inside and outside. Inside the tank are installed five transversed and one longitudinal baffles, constructed of 9/64-inch steel, all of which are securely fastened to the outside shell and to each other by using angle-iron clips, welded at points of contact. The cross baffles are placed in such a position so that they are alternately within 3½ inches of the bottom and within 3½ inches of the top of the tank, leaving a space sufficient for accessibility in the event it is required. By so arranging these baffles it eliminates any great amount of clear space, thereby reducing splashing.

In designing the tank due consideration should be given to the amount of gallonage to be hauled and it then should be of a proper size that the shell itself will be entirely filled with cargo when loaded to capacity. This provides a solid load for transportation, expansion being provided for in dome capacity as requirements may justify.

The oval-shaped tank is used as it is found to be much more serviceable than a round tank on account of the low center of gravity, and in our opinion it makes a better looking piece of equipment upon the highway. An internal automatic valve should be installed to eliminate possibility of leakage from the unloading line in the event of accidents.

The pipe assembly should be so designed that it will be protected from collision as much as possible; for example, if placed under the rear end of the truck or trailer frame it will not be damaged by the equipment on which tank is mounted in the case of head-on collisions and also it will be protected by the frame or the tank if run into from the rear.

The gross pay load of a truck and trailer averages 5,500 gallons. As before stated, this pay load can be increased by reducing the weight of material in tank construction, but we do not feel it good practice to do so, and I believe our operations will support this contention.

As reported at the meeting of the Pacific coast group of the General committee on Automobile Transportation on July 25, 1928, in the years of 1925-26-27 and the first six months of 1928, trucks have traveled 44,079,-817 miles on the highways in the Pacific Coast section, transporting 1,208,-006,361 gallons of products with a spillage of only 5,727 gallons or .00048 per cent of the amount transported. The above figures are compiled from the operations of both transport and oil companies.

The business of companies engaged in the transportation of petroleum products, and in no wise connected with the production or sale of refined commodities, is steadily increasing and during the calendar year of 1928 more than 250 million gallons will be moved by this method, and over 3,250,-000 unit miles traveled, a truck and trailer being considered as a unit.

There is at the present time on the Pacific coast an investment of about $2,000,000 in transport equipment of single compartment tank design, all owned outside of the petroleum companies. This equipment varies in size from 2,000 to 3,500 gallons depending upon the class, and supplies distributing depots at distances varying from a few miles to 350 miles from the source of supply.

It is not advisable to use fast-moving equipment for this service on account of the great weight which must be under control at all times, especially where the highways are congested with other vehicular traffic, as the excess speed materially increases the hazard to the public.

Commenting further upon the safety with which this method of transportation can be used I know of one instance where the fuel tank in the truck equipment sprung a leak and was ignited from the exhaust pipes. A fire was started which completely destroyed the fuel tank, cab, engine and floor boards of the equipment, but the cargo of gasoline was not damaged and it was transported to its destination and delivered intact without loss.

In another instance the driver, in descending a hill at the bottom of which was a curve, permitted his equipment to attain such a velocity that the trailer was turned over, making a complete revolution and sliding about 35 feet on its side. There were a few stone dents in the side of the tank, but the cargo was not damaged. The equipment was righted and transported to its destination without loss of cargo.

Numerous other instances of a like nature might be cited, but in four years of operation of about 40 pieces of equipment by one transport company, the only cargo lost upon the highway was 237 gallons which leaked over a period of 24 hours when the equipment was in such a position as to throw the weight of the cargo upon the vents and filler caps.

Cost accounting shows whether this truck or any other truck is being operated economically

Motor Vehicle Cost Accounting Brings Economical Fleet Operation

By G. R. Gwynne*

Read before American Petroleum Institute at Chicago, Dec. 3-6

FLEET owners should have a system to control the following angles of their business:

Cost of Actual Operating

Gasoline and lubricating oil;
Tires;
Repairs direct;
Repairs overhead;
Garage rent direct;
Garage rent overhead;
Division operating supervision;
Interest (if equipment is bought on deferred payment plan);
Insurance premiums;
General office supervision cost of other expenses;
Driver and helpers' wages;
Depreciation.

The breakdown of these accounts as itemized, I believe, is generally accepted as a standard practice, but the bone of contention is *the cost of breaking down* and the voluminous records as a result therefrom.

The usual practice in most companies is to make the automotive cost accounting a subsidiary set of records and the accountants have great difficulty in getting any kind of a balance between these subsidiary records and their general ledger accounts, due entirely to the complication.

Costs alone do not tell us the whole story and in addition to them we must have the physical angle or the actual operations in order to establish a *unit of cost.*

These in the oil industry are as follows:

Marketing Department

Number of days available for use;
Number of days out for repairs;
Miles traveled;
Time in hours and minutes used;
Total gallons (if tank truck) gasoline, refined oil, distillate, fuel oil, gas oil, etc.;
Total pounds if stake truck;
Total gallons and pounds if dual truck.

With these figures the work any given motor vehicle is doing can readily be determined and its cost per gallon or per 100 pounds actually arrived at. This is a vital factor in determining how many units are actually needed at any given station be it substation or main station.

In addition to the above it is essential to provide:

Gallons of gasoline used;
Quarts of lubricating oil used.

In the Continental Oil Co. some years ago, one of our executives conceived the idea of making the automotive records part of the whole of the general accounting and not have them subsidiary accounts or records, and I will analyze the results of 10 years' experience with this method.

Any expense should be analyzed at its source so we will start with first:

GASOLINE AND LUBRICATING OIL

These products are drawn the same as any customer would draw them, and are billed at tank wagon prices direct to the unit. We do not attempt to get to actual cost on these two commodities for two reasons: First, the cost of clerical help to price-extend these in the division office is prohibitive, and second, the cost per mile or per unit is then comparable with other companies who pay tank wagon prices.

TIRES

All new casings, tubes and rims, and repairs thereto are chargeable direct to the unit. We issue standard specifications on these items to operators, also prices and usually these articles are purchased out of expense money or petty accounts.

REPAIRS DIRECT

Inasmuch as 95 per cent of our repairs are effected by our own personnel, these are handled on what is known as a job order or inspection report. This form is drafted up so that it can be used for either case or both.

In either case all actual operations are listed, hours of labor shown and a detailed "bill of material" attached, which is forwarded to and approved or disapproved by the home office automotive department. This gives actual control of all base shops and mechanics to the home office.

These job orders and inspection reports are price-extended at division headquarters and footed to reveal the total cost of the job. In the event it is an estimated job and it has been approved, all requisitions for ma-

*Automotive transportation department, Continental Oil Co., Denver.

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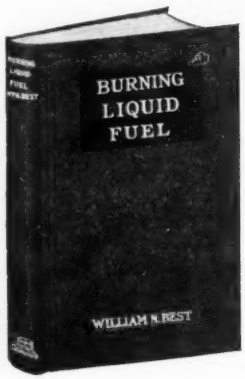

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The book takes up the manufacture of various lubricating oils and greases; tests by which oil and grease specifications are written; general discussion of lubrication problems in cylinders, turbines, internal combustion engines; power transmission machinery such as shafting; wire ropes; belts, gears, bearings, etc., driven machines such as air compressors, pneumatic tools, ice machinery, machine tools, textile machinery, paper mills, mine and quarry machinery.

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terial are made up in sufficient copies when the job is routed through the shop and one is sent to the home office.

As these copies flow in they are checked against the estimated bill of material daily. This serves two purposes, an engineering check on the material being purchased and the progress of the job through the shops. I could go on at great length as to the details, but would be here for a week, so will analyze the next step.

As all bills payable are received by the division office, or bills paid by expense account or petty cash funds are received, they are routed direct to the voucher desk and entered in the voucher register and charged to the general automotive account, after which they go to the automotive clerk who posts the charges to a Unit Sheet. These sheets must then balance as a total against the general ledger account and convey the financial statement of all automotive expense directly to the home office accounting department after which they are forwarded to the home office automotive department and here they are posted to the accumulative unit sheets.

A SIMILAR system is employed in the production department, but we do not have pounds or any weights; only hours distributed to joint lessees and total miles traveled and we base our charges to joint lessees on the per diem basis.

On tank trucks the "sub-station agent" or "gauger at main station plants," makes up the customary "gauge in and gauge out reports." This is the basic record of bulk stock loss or gain in so far as tank trucks are concerned. To this report has been added "time in and time out," also "miles traveled."

These sheets are made out daily and are checked the following day with the dray tickets in the division office, after which they are forwarded to the automotive clerk, who foots them up and posts the total only at the end of the closing month to a special automotive form by stations, thus, compiling a record of all trucks under each station.

The report can be readily and rapidly analyzed as to the total volume of the station and what each unit is putting out and constitutes control of the number of units required at the station, also the payroll as to the number of drivers.

Overhead consists of (1) general office supervision, payroll, incidental expenses; (2) division office, supervision and clerical help, and (3) garage shop—supervision, tool replacement and depreciation, building depreciation and upkeep, water, heat, light, power.

We stock no parts and have no overhead in this direction. As each mechanic writes up his own job order inspection reports and bills of material his time is charged direct to the unit and does not constitute an overhead.

Traveling inspector's overhead includes, dead time traveling, railroad fare, hotel and meals. At substations, garage building depreciation and upkeep, water, heat, light and power and warehousemen's time, cleaning up garage, tending furnace, etc.

All these accounts clear through the division office, are accumulated and prorated to the various units so that each unit carries its fair burden of overhead.

NOW to analyze the cost of accumulating these costs of motor vehicles. Whether you do or do not have a cost accounting method by unit or otherwise, you still have all the costs less possibly some clerical hire, so we will analyze the clerical cost.

One automotive clerk hired at $120 per month can handle all details of entry in compiling these costs in the division office on 60 assorted passenger cars and motor trucks easily. This represents $2 per month per unit.

In the general office the clerical expense in checking and posting these costs amounts to 25 cents per unit. This represents $2.25 per unit per month in clerical help to compile cost sheets for the analysis and study by the executives of the company.

These costs do not include clerical payroll necessary to price-extend and write orders for material or the payment of bills or the auditing of accounts, as this expense would be necessary—cost accounting or no cost accounting.

What is the total cost of supervision and clerical expense for engineering, route and personnel supervision, price extension, payment of bills and auditing?

Including the entire home office, automotive department expense, all division office expense, it is a remarkably low figure of $13.43 per unit per month, including all passenger cars, trucks and tractors, or equals 9.4 per cent of the total monthly average cost, which is $142.84.

General office equals $3.74 per unit per month or 2.6 per cent.

Division office equals $9.69 per unit per month or 6.8 per cent.

I BELIEVE it is conceded that 10 per cent for payroll overhead is considered very low, when it is considered that all engineering and drafting expense, all route supervision of tank trucks, all accounting expense of any nature and all statistical expense is taken into consideration in the above figures.

From a percentage basis following are the various items that go to make up the whole for the fleet, using 1927 figures:

Operating Expense

Gasoline and lubricating oil	13.0%	
Tires	4.9	
Repairs direct	17.0	
Repairs overhead	6.7	
Garage rent direct	1.8	
Garage rent overhead	6.9	
Division operating supervision	6.8	
Insurance	0.9	
Gen. office supervision	2.6	
Total operating		60.6%
Driver and helper's wages	25.7	
Depreciation	13.7	
Total these two		39.4%
Grand Total all		100.0%

It will be noted that the highest individual expense is driver and helper's expense, which is 25.7 per cent of the total and that Repairs and Repair Overhead amounting to 23.7 per cent, constitute the second largest item. It has been our practice to establish cost controls to tell us at all times where we stand on these two major items and to bring them under the control of the home office automotive department.

What has cost and control accomplished for our company? I can only answer this question by quoting facts.

Trucking Accounts Reveal Leaks and Save Profits

IT IS necessary to conduct a profitable business to know what are the costs of doing that business. One of the most costly items in the marketing division of our industry is trucking, yet a great many companies do not have accurate data on the expense their fleets entail and whether units of the fleets are being operated profitably or at a loss.

Mr. Gwynne has spent 15 years as a fleet operator for the Continental Oil Co., which markets petroleum products in the Rocky Mountain states directly and through subsidiaries in the Mid-Continent states. He presents here the items a motor vehicle cost accounting system should show and the relationship of the accounting system with economical fleet operation.

Mr. Gwynne in his preamble to the paper published here said: "Cost accounting and proper statistics offer the only control which can lead to economic business management, be it operating motor trucks or canning sardines."

He asserts that if many companies knew their actual costs of trucking they would discontinue many uneconomic practices, such as trucking gasoline many miles and selling it at bulk station prices.

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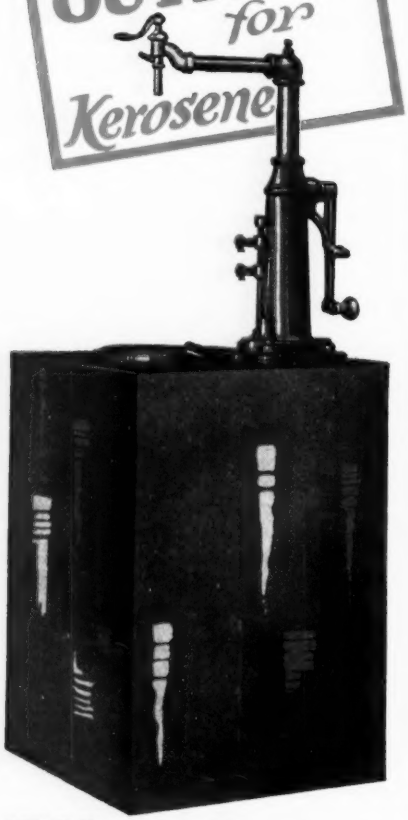

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Other sizes, 120-gallon capacity, Model 1205 tank 28¾" square by 35½" high. Over-all height 60". Round outfits are Model 1060, 60 gal. capacity, 22⅛" diameter; and Model 1100, 110 gal. capacity, 30" diameter.

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Paralleled are the cost per mile for 1922 and 1927:

	1922	1927
Cost per mile—Tires	$.0141	$.0086
Cost per mile—Repairs	.0556	.0297
Cost per mile—Operating	.1437	.1056
Cost per mile—Other	.1630	.0691
Grand Total	$.3067	$.1747

It is self-evident that the grand total cost per mile has been reduced in 5 years 13.2 cents per mile, or a total of 43 per cent, and the volume of work and miles was increased—miles 300 per cent, gallons and pounds delivered 100 per cent. This is my argument to the question, "Does it pay to keep individual cost records?"

What use is made of individual cost records and what are the main values?

1.—Determination of what each unit is producing at the station it is assigned to. If tank truck, what are the production hours, the miles, the volume handled and, finally, the cost per gallon delivered; also what is the cost per gallon for all tank trucks for the station?

2.—Determination of what each stake truck is producing in total pounds, total hours and total miles, and what is the cost per hundred pounds delivered and what is the total per hundred pounds for all dray trucks at this station?

3.—What is the cost of tires, gasoline and lubricating oil, repairs, etc., and if these costs are high, is the responsibility to be placed on the shoulders of the operating personnel, or, in case of repairs, should it be placed on the base shop traveling inspectors?

4.—Gives a complete control on the quality and quantity of work being done by the shop forces.

5.—Establishes our purchasing policy through actual cost fact and determines the quality and economy of all accessories.

6.—Determines our engineering principles based on fact of operating conditions and comes back to "Cost per unit of delivery."

7.—Is of material assistance to the marketers on establishing prices at any given point and is of material benefit in determining whether the station is a liability or an asset. At this point it should not be overlooked that motor vehicle cost represents the largest item of expense at any substation.

8.—Is of some value in determining the relative values between manufacturers' various passenger cars and motor trucks.

In my research of many companies throughout the United States it is apparent that we have as many systems and ideas as we have companies and individuals, and it is my belief that if we can get together on this all important angle we can materially reduce our overhead expenses and also our operating expenses to such an extent that we can save our respective companies hundreds of thousands of dollars annually.

From my travels and experience I am firmly convinced that if a great many major oil companies had the true facts as to the cost of delivery of a gallon of gasoline many things now apparent in the industry would be discontinued. For instance, it is common practice to deliver gasoline and refined oil up to a 50-mile radius of substation at substation prices and at least 80 per cent of these deliveries would be discontinued if the marketing department executives actually knew what it was costing them.

This statement is made advisedly, and I cite three different cases which are probably common with others. During the past three years we have merged or purchased outright three large concerns. In the first instance the general manager in charge of sales called me to his office and put a direct question to me as to what it cost per month to operate equipment under the Continental Oil Co. plan. I advised him at that time $168.75 per month, and he ridiculed me as to our high cost, and advised that his costs were but $45 per month.

I HAD just made a field survey of their equipment and cited one substation as being typical of all sub and main stations. At the station in question they had assigned eight units of various makes and sizes, two had no motor in them, one had no transmission, one had no rear axle. I found one truck back of a discharged employe's barn, half covered with manure and found still another on a lonesome road in the sand hills, where it had broken down, half drifted over with sand. This particular truck had four new Kelly Cat solids on when abandoned and were naturally dead, as the truck had been there for over a year. The general manager mentioned had arrived at his cost per month by taking the total cost and divided it by the number of units and the foregoing is a concrete example of what was found over the entire territory to a more or less degree.

In a second case, after organizing the outfit and properly motorizing it, the number of units was reduced 33 1-3 per cent and the volume delivered increased 25 to 35 per cent.

In a third instance, in a rather large city, when we took over the plant, they had 18 units, all junk, all of which were absolutely worthless and were disposed of. We then remotorized it with six units and are handling more product today with the smaller fleet than was handled with the old lineup.

Cost accounting, from an individual standpoint has one more all important point in its favor, and that is, it tends and does much toward establishing personal responsibility and promoting honesty among all employes. There is far less chance for trusted em-

ployes to yield to temptation if they realize that their responsibility is fixed by record and that any dishonesty on their part will be liable to immediate discovery.

As a final argument in favor of individual unit cost control, I submit a few facts on a 3½-ton, 1000-gal. model E Packard truck operated in Denver for eight years:

Total miles	Average gallons delivered per month	Average miles run per month	Cost per gallon
15,306	134,687	901	.0024
29,046	114,894	764	.0027
(Note: Average miles and gallons per month dropped and cost went up.)			
48,074	145,241	985	.0022
80,556	148,610	1000	.0022
Sold—94,929	150,633	999	.0021
Last Mo. operated	175,358	950	.....

The chassis of this job was sold for $450, showing it was in good condition, but had reached the point where it would not remain economical to operate it, due to no replacement parts.

The final cost per gallon delivered was .0021, as compared with .0024, or a saving of .0003 by 14,310,099 gallons equals $4293.03.

Inasmuch as our cost for supervision, both general office and division office, including all angles, namely, routing, engineering, drafting, accounting, etc., amounts to $13.43 per unit per month by 95 months, which this unit was operated, equals $1275.85 for this unit; $4293.03 minus $1275.85 equals $3021.18 net saving, and proves again that the individual unit cost, if properly used, pays dividends.

This truck is not a banner unit, but was picked for its age and mileage and represents the true condition of the entire fleet.

I now refer you to the Oct. 24, 1928, issue of the NATIONAL PETROLEUM NEWS, page 50, subject, "Cost Accounting for Oil Production," written by Lester C. Uren, professor of petroleum engineering, University of California, wherein he states that unit cost records are the only reliable results of industrial efficiency. Cost records are of value in making comparisons of the production efficiency of an organization as between one period of operation and another that serve to call the attention of responsible officials to unusually high or low costs which may result through carelessness. Wasteful methods in the one case or highly efficient methods in another will often result in investigations which will disclose the reasons thereof, etc., etc.

Compact, simplified individual motor vehicle records, properly compiled, and actually used, are the basis of actual management and through this medium the transportation man can properly develop himself along engineering, commercial accounting and purchasing agent lines and be of more value to his organization as a whole.

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Crude and Gasoline Stocks Gain in October

WASHINGTON, Dec. 1.—Although crude production increased during October, refinery operations were at a lower rate than during September, according to the U. S. Bureau of Mines. Total crude production in October was 79,662,000 barrels, an increase of 3,258,000 barrels over September. This is at the rate of 2,569,742 barrels daily in October, compared with 2,546,800 barrels daily in September, or a gain of 22,942 barrels.

Crude stocks east of California increased 1,379,000 barrels, standing at 368,031,000 barrels Oct. 31. Crude stocks in California gained 334,000 barrels, to 113,767,000 barrels.

Although total gasoline production for October, a 31-day month, gained 776,000 barrels over September, a 30-day month, output decreased 10,936 barrels daily. Total production was 34,319,000 barrels, compared with 33,543,000 barrels in September.

Gasoline stocks increased but 48,000 barrels in October, standing at 26,453,000 barrels Oct. 31.

Kerosene production was about even with that of September, 167,290 barrels, compared with 167,900 barrels daily in September. Stocks gained 21,000 barrels, totaling 8,614,000 barrels at the end of October.

Gas and fuel oil production fell off 41,397 barrels daily average, to 1,193,903 barrels, compared with daily average of 1,235,300 barrels in September. Total output for October also fell off 48,000 barrels, to 37,011,000 barrels. Stocks were 136,723,000 barrels at the end of October.

Production of lubricants totaled 2,979,000 barrels in October, compared with 2,833,000 barrels in September. Stocks totaled 7,830,000 barrels on Oct. 31, a gain of 66,000 barrels over Sept. 30.

Collett Quits; Landreth Prorating Chairman

HOUSTON, Nov. 29.—James D. Collett, individual oil operator of Fort Worth, has resigned as chairman of the Winkler county advisory committee on prorating practice and also as member of the committee. Business demands on his time were such, he said, that he felt he should be allowed to retire.

Ed A. Landreth, president of the Landreth Production Co., Fort Worth, succeeds Mr. Collett as chairman of the Winkler advisory committee. F. J. Adams, general agent at Fort Worth of Gulf Production Co., takes his place on the committee.

S.O. New Jersey Forms Subsidiary To Speed Joint Export Body

Photo by Blank-Stoller, Inc.

D. L. Harper

CLEVELAND, Dec. 1

THE export organization of five operating subsidiaries of the Standard Oil Co. (N. J.) have joined in forming a new company styled the Standard Oil Export Corp. This new company, chartered in Delaware, will be the New Jersey company's representative in the American Petroleum Export Association which leading petroleum exporters are expected to form early in 1929.

The five subsidiaries which joined to cause the incorporation of the new company are the Standard Oil Co. of New Jersey, which is the operating company, Standard Oil Co. of Louisiana, Humble Oil & Refining Co., Carter Oil Co. and Stance, Inc.

The parent company issued this statement in New York:

"About a month ago announcement was made that certain American petroleum companies had under consideration a proposal for the formation, under the Webb-Pomerene act, of an export association to deal in crude petroleum and its products.

"As a step toward consummation of this proposal, five operating units affiliated with the Standard Oil Co. (N. J.) have joined in causing to be incorporated under the laws of Delaware, the Standard Oil Export Corp., with an authorized capital of 100 shares of no par value stock. The member companies are Standard Oil Co. of New Jersey (a Delaware corporation), Standard Oil Co. of Louisiana, Humble Oil & Refining Co., Carter Oil Co., and Stance, Inc., all of which are engaged in export trade.

"The new company will constitute the Webb export association of the Standard Oil Co. (N. J.) interests and will be eligible to take membership representing those interests in the general association when the latter is formed.

"The officers of the Export Corporation are to be D. L. Harper, president; W. R. Mook, vice-president; C. T. White, secretary; M. H. Eames, assistant secretary; R. F. Resor, treasurer, and C. B. Millard and Ph. Berau, assistant treasurers, all of New York."

Mr. Harper has been in general charge of the export activities of the Standard Oil Co. of New Jersey since the death of Frederick Asche, who was vice-president in charge of exports. Mr. Harper had been assistant to Mr. Asche. Mr. Mook was an aid to Mr. Harper.

Organization of this corporation is the first important public action taken toward a cooperative petroleum export organization under the Webb-Pomerene act of 1918 since representatives of the leading oil exporters met Oct. 15 with Walter C. Teagle, president of the New Jersey parent company, in New York.

The Webb-Pomerene act permits exporters of an industry to organize and operate their foreign markets jointly even to the extent of fixing prices so long as prices so fixed do not reflect in the domestic United States market.

At the New York meeting with Mr. Teagle these men were present: J. A. Moffett, Jr., and C. O. Swain, Standard Oil Co. of New Jersey; Axtell J. Byles, Tide Water-Associated Oil Co.; W. M. Irish, Atlantic Refining Co.; J. Howard Pew, Sun Oil Co.; Frank R. Coates, Cities Service Co.; E. W. Marland, Marland Oil Co.; Herbert L. Pratt, and C. F. Meyer, Standard Oil Co. of New York; Harry F. Sinclair, Sinclair Consolidated Oil Corp.; Robert W. Stewart, Standard Oil of Indiana; R. G. Stewart, Pan American Petroleum & Transport Co.; F. Godber, Shell interests; K. R. Kingsbury and Oscar Sutro, Standard of California; W. L. Mellon and George S. Davison, Gulf Refining Co.; Edward Prizer and G. P. Whaley, Vacuum Oil Co.; R. C. Holmes and Mr. Kline, The Texas Corp. and L. P. St. Clair, Union Oil Co. of California.

Correction

On page 85 of the Nov. 21 issue of NATIONAL PETROLEUM NEWS it was stated that the Louisiana Oil Refining Corp., Shreveport, was building a filling station at New Orleans. This was an error, the company claiming that it is building no service station at that point. The company has recently completed a filling station at Oberlin, La.

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SWAN FINCH
100% Pennsylvania Oils

Gulf Transfers Pyron To Los Angeles

HOUSTON, Nov. 29.—Walter B. Pyron, third vice president of the Gulf Production Co., Houston, will be transferred to Los Angeles, effective Jan. 1, to assume executive charge of California operations of the parent Gulf Oil Corp. The Gulf operates in California as the Pacific Eastern Oil Corp.

Announcement of Mr. Pyron's transfer follows earlier published reports that H. K. V. Tompkins, general agent of the Mexican Gulf Oil Co., at Tampico, would become assistant to Underwood Nazro, second vice president of Gulf Production Co., Houston, Jan. 1.

Mr. Pyron has been identified with the Gulf organization since about 1907, when he entered the old Beaumont office as a stenographer. Two years later he went to Shreveport as agent and acquired for his company the phenomenal Ferry Lake lease, originally known as the "old frog pond." Later, he was made a vice president while in executive charge of Shreveport district operations of the Gulf Refining Co. of Louisiana.

When Ranger and Burkburnett flashed across the petroleum horizon he was transferred to north Texas division headquarters of Gulf Production Co., in 1918. He remained there until a few years ago when he moved to Houston.

Mr. Pyron has been active in civic and fraternal affairs in addition to his widely recognized activities in the petroleum industry.

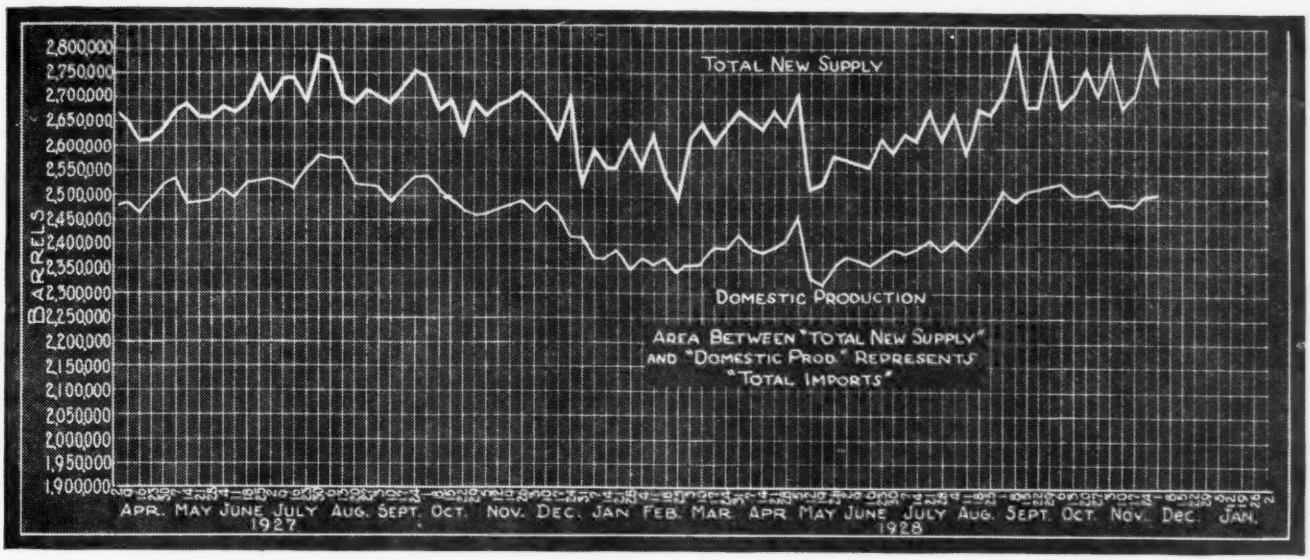
U. S. Asks Bids on Cat Creek Royalty Oil

WASHINGTON, Nov. 30.—The Secretary of the Interior has issued a call for bids for the sale of the royalty oil accruing to the United States from leases on government land in the Cat Creek oil field, Mont., for three years, beginning Feb. 1, 1929. The advertisements will be published in papers in Montana and Wyoming.

Bids must be based upon the highest posted field price for oil of 39 to 39.9 gravity in Oklahoma and Kansas, and/or in Montana, whichever is the higher, and must be stated as a differential in cents per barrel from such posted price. Delivery of royalty oil will be made on each leasehold for the account of the successful bidder, and such delivery will be made to the pipe line taking the majority of the oil from the leasehold.

Total government royalty oil from the Cat Creek field in 1927 was about 39,800 barrels, and from Jan. 1 to Sept. 30, this year, about 23,200 barrels, average gravity being about 49 degrees A. P. I.

Daily Average Crude Oil Production and Imports



Daily average gross output of United States, by fields, for week ending with dates below as compiled by American Petroleum Institute

PRODUCTION SUMMARY

	Dec. 1	Nov. 24
Production east of Rockies	**1,829,350**	**1,839,200**
Decrease		**9,850**
Total production in U. S.	**2,506,150**	**2,505,000**
Increase		**1,150**
Crude oil imports	**228,857**	**301,714**
Decrease		**72,857**
Total crude supply	**2,735,007**	**2,806,714**
Decrease		**71,707**

OKLAHOMA

	Dec. 1	Nov. 24
North Braman	2,700	2,700
South Braman	1,350	1,350
Blackwell	3,050	3,050
Hubbard	2,350	2,350
Thomas	1,100	1,100
Tonkawa	11,750	11,800
Garber	7,100	7,100
Burbank	25,300	25,650
Osage, outside Burbank	26,000	26,000
Cushing	20,000	20,050
Yale Jennings	7,650	7,600
Davenport	1,650	1,700
Bristow-Slick	20,200	20,200
North Okmulgee	14,400	14,400
Pearson	1,900	2,050
Lyons-Deaner	4,250	4,300
St. Louis	132,150	130,050
Allen Dome	24,900	24,100
Cromwell	8,150	8,450
Papoose	4,000	4,000
Wewoka	5,400	5,400
Seminole	40,900	41,750
Bowlegs	48,900	50,650
Searight	10,150	10,250
Little River	100,650	105,450
Earlsboro	75,300	75,850
Duncan District	7,750	7,750
Graham	4,750	4,750
Fox	1,600	1,600
Healdton	13,700	13,650
Hewitt	9,000	9,000
Scholem Alechem	14,500	14,400
Others	56,050	54,450
Total, Oklahoma	708,600	712,950
Decrease		4,350

KANSAS

	Dec. 1	Nov. 24
Greenwood County	25,500	25,600
Florence-Covert	1,000	1,000
Peabody-Elbing	3,250	3,250
Eldorado-Towanda	12,900	12,900
Augusta-Fox-Bush	3,200	3,200
Rainbow Bend	1,300	1,300
Russell	4,000	4,000
Churchill	7,700	8,100
Oxford	7,100	7,550
Others	31,300	29,400
Total, Kansas	97,250	96,300
Increase		950

NORTH LOUISIANA

	Dec. 1	Nov. 24
Homer	4,100	4,100
Haynesville	5,800	5,800
Caddo, light	9,350	9,150
Caddo, heavy	2,950	3,000
De Soto, Red River	4,150	4,050
Elm Grove	600	600
Bellevue	850	900
Cotton Valley	3,850	3,900
Urania	6,050	6,200
Pleasant Hill	500	500
Total, North Louisiana	38,200	38,200

ARKANSAS

	Dec. 1	Nov. 24
El Dorado	4,950	4,950
Champagnolle	12,250	13,050
Smackover, light	7,150	7,150
Smackover, heavy	53,650	53,750
Stephens	1,000	1,000
Nevada	1,300	1,350
Lisbon	1,700	1,700
Others	100	100
Total, Arkansas	82,100	83,050
Decrease		950

TEXAS (Outside Gulf Coast)

Panhandle District

	Dec. 1	Nov. 24
Hutchinson County	28,100	28,900
Carson County	6,100	6,100
Gray County	23,900	25,500
Wheeler County	800	800
Others	2,700	2,900
Total, Panhandle District	61,600	64,200
Decrease		2,600

North Texas

Burkburnett	9,950	9,850
Electra	12,800	12,750
Iowa Park and K-M-A	3,850	3,800
Wilbarger	32,650	32,800
Archer County	19,250	19,400
Montague-Cooke	10,050	10,200
Others	600	600
Total, North Texas	89,150	89,400
Decrease		250

West Central Texas

	Dec. 1	Nov. 24
Stephens County	7,550	7,650
Eastland-Desdemona	6,950	7,000
Brown County	10,150	10,300
Coleman County	3,900	3,950
Callahan County	3,850	3,700
Shackleford County	10,550	10,450
Young County	8,750	8,650
Throckmorton County	800	800
Palo Pinto County	350	350
Jack County	1,300	1,300
Others	700	700
Total, West Central Texas	54,850	54,850

West Texas

Jones County	5,000	3,450
Mitchell and Scurry Counties	2,750	2,700
Howard County	33,000	31,050
Reagan County	17,200	17,200
Crane and Upton Counties	54,000	53,900
Crockett County	2,850	2,850
Pecos County	70,400	67,900
Winkler County	141,200	149,150
Others	1,450	1,400
Total, West Texas	327,850	329,600
Decrease		1,850

East Central Texas

	Dec. 1	Nov. 24
Mexia	6,350	6,400
Currie	500	550
Richland	500	500
Wortham	1,500	1,500
Corsicana-Powell	10,000	9,600
Boggy Creek	1,700	1,900
Nigger Creek	700	700
Total, East Central Texas	21,250	21,150
Increase		100

Southwest Texas

Luling	13,500	13,450
Lytton Springs	1,150	1,150
Somerset	700	700
Laredo District	8,950	8,850
Dale	850	850
Salt Flat	2,300	.....
Others	800	2,750
Total, Southwest Texas	28,250	27,750
Increase		500
Total, Texas—(Outside Gulf Coast)	582,950	586,950
Decrease		4,000

GULF COAST

Coastal Texas

West Columbia	8,000	8,500
Damon Mound	1,000	1,250
Big Creek	1,800	2,050
Boling	2,900	2,950
Blue Ridge	5,700	6,200
Pierce Junction	10,650	9,750
Humble	3,750	3,800
Goose Creek	6,750	6,600
South Liberty	5,900	5,800
Hull	10,750	11,000
Saratoga	950	950
Batson	1,350	1,300
Barber's Hill	650	1,000
Sour Lake	3,000	3,200
Spindletop	35,500	37,500
Orange County	3,450	3,550
Sugarland	4,800	4,850
Others	2,850	3,150
Total, Coastal Texas	109,750	113,400
Decrease		3,650

Coastal Louisiana

Vinton	4,200	4,200
Sulphur Dome	4,000	2,000
Lockport	3,900	4,200
Sweet Lake	1,350	1,500
Evangeline	900	900
East Hackberry	5,250	5,400
Edgerly	800	800
Sorrento Dome	550	550
Others	1,450	1,600
Total, Coastal Louisiana	22,400	21,150
Increase		1,250
Total Gulf Coast	132,150	134,550
Decrease		2,400

ROCKY MOUNTAIN

Wyoming

Salt Creek	35,400	35,350
Grass Creek	2,350	2,300
Elk Basin	1,000	1,000
Big Muddy	2,550	2,600
Lost Soldier	3,650	3,650
Rock Creek	2,500	2,500
Lance Creek	350	350
Oregon Basin	3,500	4,350
Others	5,500	6,000
Total, Wyoming	56,800	58,100
Decrease		1,300

Montana

Cat Creek	1,500	1,500
Sunburst	7,950	7,950
Pondera	2,000	2,000
Others	100	100
Total, Montana	11,550	11,550

Colorado

Moffat (Craig)	1,250	1,250
Fort Collins	2,250	2,300
Florence	1,250	1,200
Others	2,300	2,350
Total, Colorado	7,050	7,100
Decrease		50

New Mexico

Table Mesa	.....	250
Hogback	500	500
Artesia	1,050	1,050
Rattlesnake	1,050	900
Others	100	250
Total New Mexico	2,700	2,950
Decrease		250
Total, Rocky Mountain	78,100	79,700
Decrease		1,600

CALIFORNIA

Santa Fe Springs	70,500	66,000
Long Beach	192,000	192,500
Huntington Beach	51,000	51,500
Torrance	16,000	16,000
Dominguez	10,000	10,000
Rosecrans	6,500	5,500
Inglewood	27,800	28,000
Midway-Sunset	76,000	75,000
Ventura Avenue	52,000	52,000
Seal Beach	28,500	26,000
Others	147,500	143,300
Total California	676,800	665,800
Increase		11,000

EASTERN

(Including Ill., Ind., Ky., O., W. Va., Pa., and N. Y.)	110,000	107,500
Increase		2,500

Compilation Of Mid-Continent Refinery Operations

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National Petroleum News

Mid-Continent Refinery Operations Week Ended November 30 (By Telegraph)

	Kansas	Oklahoma	North & Cent. Texas	North La.-Ark.	Total Week Ended Nov. 30	Total Week Ended Nov. 2
Plants Reporting	12	29	28	12	81	81
Da. Av. Cap. (bbls.)	92,000	160,200	125,100	54,900	432,200	432,200
Da. Cracking Capacity	30,700	52,600	17,200	22,700	123,200	123,200
Da. Av. Crude Runs	62,926 + 25.4	101,928 — 5.7	88,280 + 10.5	60,233 + 2.5	313,367 + 5.5	334,792
Da. Av. Other Oils	7,939 + 50.8	8,546 + 19.2	4,174 — 5.4	2,495 — 13.3	23,154 + 17.4	21,217
GASOLINE—Gallons						
Stocks, Nov. 23	10,543,000	34,707,000	21,631,000	6,379,000	73,260,000	57,278,000
Prod. 11-23 to 11-30	9,540,000 + 18.8	16,981,000 — 10.0	9,910,000 + 6.1	6,732,000 + 16.1	43,163,000 + 2.7	43,549,000
Ship. 11-23 to 11-30	8,349,000 + 4.6	15,097,000 + 0.2	9,042,000 + 6.5	6,387,000 + 6.9	38,875,000 + 3.6	39,939,000
Stocks, Nov. 30	11,734,000 + 11.3	36,591,000 + 5.4	22,499,000 + 4.0	6,724,000 + 5.4	77,548,000 + 5.9	60,888,000
Ratio Sales to Prod.	87.5%	88.9%	91.2%	94.9%	90.1%	91.7%
KEROSENE—Gallons						
Stocks, Nov. 23	8,075,000	5,466,000	*2,505,000	424,000	16,470,000	14,308,000
Prod. 11-23 to 11-30	2,074,000 + 42.9	2,224,000 — 12.0	1,615,000 — 6.4	439,000 + 56.8	6,352,000 + 6.2	6,132,000
Ship. 11-23 to 11-30	2,058,000 + 29.6	1,916,000 — 13.3	2,304,000 +101.8	517,000 + 88.0	6,795,000 + 30.3	4,799,000
Stocks, Nov. 30	8,091,000 + 0.2	5,774,000 + 5.6	1,816,000 — 27.5	346,000 — 18.4	16,027,000 — 2.7	15,641,000
Ratio Sales to Prod.	99.2%	86.2%	142.7%	117.8%	107.0%	78.3%
STOVE DISTILLATE—Gallons						
Stocks, Nov. 23	1,992,000	3,807,000	463,000	38,000	6,300,000	6,838,000
Prod. 11-23 to 11-30	235,000 + 69.1	672,000 + 5.3	236,000 — 6.7	104,000 — 21.2	1,247,000 + 7.3	1,453,000
Ship. 11-23 to 11-30	144,000 — 12.2	790,000 + 17.0	245,000 + 15.0	107,000 — 39.5	1,286,000 + 4.6	1,066,000
Stocks, Nov. 30	2,083,000 + 4.6	3,689,000 — 3.1	454,000 — 1.9	35,000 — 7.9	6,261,000 — 0.6	7,225,000
Ratio Sales to Prod.	61.3%	117.6%	103.8%	102.9%	103.1%	73.4%
GAS OIL—Gallons						
Stocks, Nov. 23	5,844,000	32,612,000	12,350,000	6,119,000	56,925,000	60,147,000
Prod. 11-23 to 11-30	1,448,000 — 22.8	2,014,000 + 59.1	2,559,000 + 17.1	2,150,000 — 2.1	8,171,000 + 19.6	8,684,000
Ship. 11-23 to 11-30	1,329,000 — 30.7	4,615,000 +140.2	1,839,000 + 3.1	2,282,000 — 5.4	10,055,000 + 25.3	10,440,000
Stocks, Nov. 30	5,963,000 + 2.0	30,011,000 — 8.0	13,070,000 + 5.8	5,987,000 — 2.2	55,031,000 — 3.3	58,391,000
Ratio Sales to Prod.	91.8%	229.1%	71.9%	105.1%	123.2%	120.2%
FUEL OIL—Gallons						
Stocks, Nov. 23	28,176,000	56,365,000	70,835	22,756,000	178,132,000	183,186,000
Prod. 11-23 to 11-30	6,449,000 + 18.9	7,290,000 — 2.0	10,804,000 + 1.4	8,972,000 + 14.0	33,515,000 + 6.8	37,326,000
Ship. 11-23 to 11-30	6,467,000 — 9.5	7,647,000 — 19.5	12,349,000 + 1.2	9,272,000 + 21.0	35,735,000 — 2.1	34,109,000
Stocks, Nov. 30	28,158,000 — 0.1	56,008,000 — 0.6	69,290,000 — 2.2	22,456,000 — 1.3	175,912,000 — 1.2	186,403,000
Ratio Sales to Prod.	100.3%	104.9%	114.3%	103.3%	106.6%	91.4%

Gasoline Produced by Various Methods, Week Ended November 30

	Kansas	% of Total	Oklahoma	% of Total	Texas	% of Total	Louisiana-Arkansas	% of Total	Total	% of Total
Straight Run	6,219,000	65.2	9,887,000	58.2	7,812,000	78.8	3,398,000	50.5	27,316,000	63.3
Cracked	2,816,000	29.5	6,282,000	37.0	1,803,000	18.2	2,833,000	42.1	13,734,000	31.8
Natural	505,000	5.3	812,000	4.8	295,000	3.0	501,000	7.4	2,113,000	4.9
Total	9,540,000		16,981,000		9,910,000		6,732,000		43,163,000	

*This figure was shown through typographical error as 1,505,000 in Nov. 28 issue, page 92.

+ or — columns are % change from previous week.

Stocks of All Products Except Gasoline Are Lowered

Staff Special—By Telegraph

TULSA, Dec. 4

STOCKS of all major commodities except gasoline were reduced by 81 Mid-Continent refiners the week ended Nov. 30, according to their reports to NATIONAL PETROLEUM NEWS. Gasoline stocks were increased 4,300,000 gallons.

Crude runs were increased almost 7000 barrels daily average for the field as a whole, the total daily average being 313,367 barrels. Kansas refiners showed an increase of more than 12,000 barrels for the week but this was because several of them had been shut down a part of the previous week because of floods. Oklahoma refiners curtailed their runs 6000 barrels daily average but the Texas refiners increased runs more than 8000 barrels daily average. The Louisiana-Arkansas refiners increased runs

Summary for the Month

Production and shipments, all reporting refineries, for four weeks ended Nov. 30. Change in stocks figured from Nov. 2.

	Gallons
GASOLINE	
Production	170,502,000
Shipments	153,842,000
Net change in stocks	+16,660,000
Ratio sales to production	90.2%
KEROSENE	
Production	25,072,000
Shipments	24,686,000
Net change in stocks	+386,000
Ratio sales to production	98.5%
STOVE DISTILLATE	
Production	4,624,000
Shipments	5,588,000
Net change in stocks	—964,000
Ratio sales to production	120.8%
GAS OIL	
Production	29,386,000
Shipments	32,746,000
Net change in stocks	—3,360,000
Ratio sales to production	111.4%
FUEL OIL	
Production	127,566,000
Shipments	138,057,000
Net change in stocks	—10,491,000
Ratio sales to production	108.2%

slightly more than 1000 barrels daily average during the past week.

The increase in crude runs caused an increase in gasoline production of slightly more than 1,000,000 gallons, the total for the week being 43,163,000 gallons. All areas except Oklahoma shared in this increase. Oklahoma refiners curtailed production 1,800,000 gallons.

Gasoline shipments increased 1,300,000 gallons. All areas except Oklahoma shared in the increased business. Oklahoma refiners' shipments were virtually unchanged.

With total shipments for the week at 38,875,000 gallons stocks increased 4,288,000 gallons to 77,548,000 gallons. For the corresponding week in 1927 stocks on hand totaled 66,008,000 gallons, or 11,500,000 gallons less than at present. Stocks at present are about at the level they were the last week in June.

Kerosene production increased approximately 500,000 gallons and shipments were 1,500,000 gallons more. Stocks were reduced 400,000 gallons or 2.7 per cent. The increase in business occurred in all areas except Oklahoma. The Texas refiners had the largest increase in business, the percentage being 101.8. Arkansas-Louisiana refiners had an 88 per cent increase. Kansas refiners' business increased 29.6 per cent. Oklahoma lost 13.3 per cent.

Stove distillate production and shipments were virtually the same as in the previous week. Stocks were reduced approximately 40,000 gallons. All areas except Kansas drew on stocks.

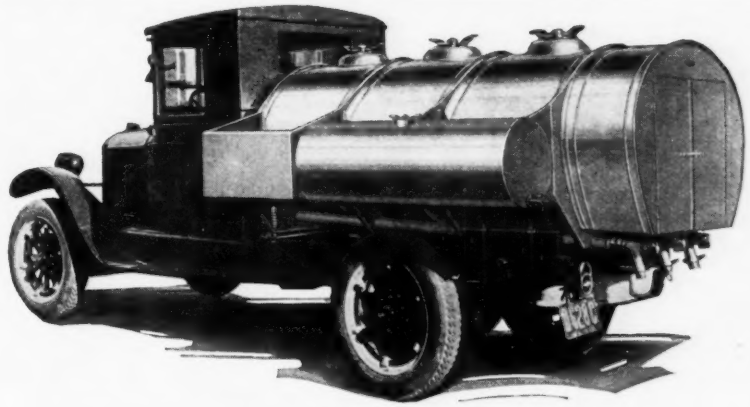
Gas oil production increased more than 1,000,000 gallons. Shipments increased 2,000,000 gallons. Stocks were reduced 1,900,000 gallons. Oklahoma refiners increased production 59.1 per cent and shipments 140.2 per cent, the ratio of sales to production being 229.1 to 100.

Fuel oil stocks were again reduced although production was increased and shipments were lower than for the previous week. Production was increased 6.8 per cent and shipments were off 2.1 per cent but stocks were reduced 1.2 per cent.

New Specialty Firm

TULSA, Dec. 3.—A new specialty firm to handle products of the Black Wire Rope Co. of Peoria, Ill., the Alexander Brothers leather and tenacular belts and the Manheim Mfg. Co. balata belts and valves, has been organized by Phil S. Stover and H. M. Robinson. The new firm will be known as Robinson & Stover, Inc.

Offices have been opened at 2005 Philtower with Mr. Stover in charge. Mr. Robinson will cover the field work. He formerly was with the American Cable Co. while Mr. Stover was with the R. & J. Dick Co.



THE IDEAL SPEED JOB

A Columbian Tank Body especially engineered for Ford, Chevrolet and the light speed trucks. Capacity 375 gallons in three compartments with the three-section side racks carrying six cans on each side.

The above illustration shows rear side-rack sections replaced by side Lube Tank. Similarly front section may be removed and the Columbian Barrel Carrier attached. Quick convertibility for all conditions.

Price with Side Racks F.O.B. Kansas City $150.00

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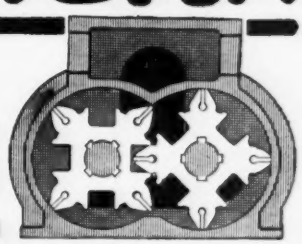
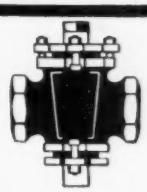


"MORE GALLONS PER HORSE POWER"

NORTHERN DOUBLE PACKED VALVES



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SINCLAIR REFINING COMPANY, INC.

Also Makers of Sinclair Gasoline and H-C Gasoline

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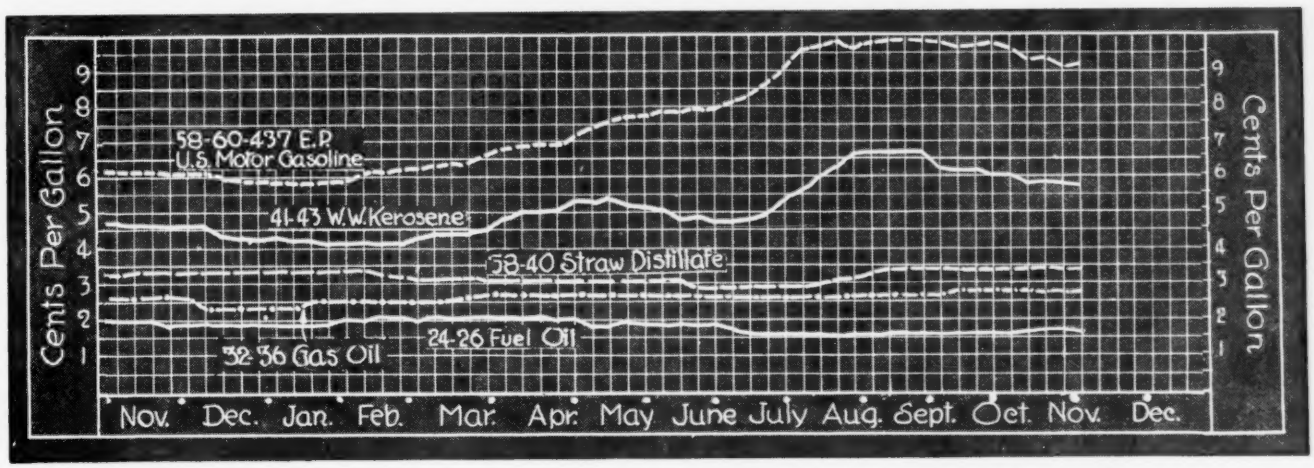
Refinery - Tank Wagon Markets

National Petroleum News

Current Prices of Principal Mid-Continent Refined Products



Prices shown are on Group 3 basis and extended to date shown in Refinery Market Tables Section of this Issue

Gasoline Buying Becomes More Active; Mid-Continent Prices Narrow

Staff Special
TULSA, Dec. 1

MORE active spot buying of gasolines by the domestic trade was noticed in the Mid-Continent the last week of November. A few larger jobbers and several carload marketers also bought some gasolines for December delivery, and while prices in most areas lost some ground the trade generally believed prices were on a more stable basis.

Exporters showed virtually no interest in either the Texas or Oklahoma market.

Natural gasolines were generally unchanged in price throughout the holiday week. Demand was reported lighter, however, and goods Dec. 1 were more freely offered than earlier in the week.

Kerosenes were in light demand. Distillates and gas oil were active in all areas. Prices were unchanged. Fuel oils were steady at unchanged prices, with some active buying for both spot and over the month. Neutral oils and cylinder stocks were quiet. Wax was more freely offered at lower prices.

Gasolines

The wide range of gasoline quotations which were being reported around Nov. 26, was narrowed later in the week when several refiners, especially those in Oklahoma, who had been at the top of the range reduced their quotations fractionally, and other refiners both in Oklahoma and in other areas, who had been making the low side of the range, advanced their prices 0.125 to 0.375 cent a gallon.

Taking the Mid-Continent as a whole the price range on 58-60 U. S. Motor appeared to be more stabilized at 8.25 to 9.25 cents a gallon. One or two refiners in Oklahoma who had moved some of their production at the lower price, but who do not report their spot sales to either Platt's Oilgram or the NATIONAL PETROLEUM NEWS, announced late in the week that their quotations were 8.50 cents a gallon.

Refiners in other areas continued to ask from 8.25 cents up for their gasoline except in the west Texas area and a spot or two in the Panhandle district where prices were from 8 to 8.25 cents a gallon.

Although the week was cut short by the holiday, spot sales of 58-60 U. S. Motor the first four days of the week as reported by Oklahoma refiners, totaled 261 cars as compared with the sales of 248 cars the week of Nov. 17 to 23 inclusive.

One large jobber who is generally considered one of the shrewdest buyers in the Mid-Continent, entered the market for 250 cars or more of gasoline for over December delivery. This jobber has been buying a considerable part of his requirements on the spot market and many of the trade here were inclined to take his December buying as an indication he was of the opinion the market had about reached bottom.

The majority of existing contracts which allow a margin of 4.50 cents a gallon, are netting refiners around 8.50 cents a gallon for U. S. Motor at the present tank wagon levels. For the last week or 10 days jobbers have been able to buy in several districts at less than 8.50 cents a gallon, Group 3 freight basis, and they have been buying more goods on the spot

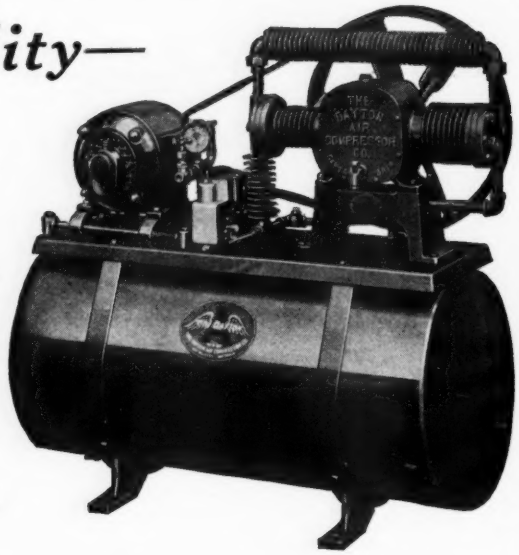
Dependability—

Simplicity—

Low price—

all

combined in



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Today, more than ever before, the first thought that enters most buyers' minds is dependability. And the years of uninterrupted service experienced by users, prove that Dayton Compressors are wholly dependable; they are built to deliver the goods.

"Daytons" are probably the simplest Air Compressors built, the two-stage types containing fewer parts than any on the market. They contain

No connecting rods—
No cotter pins—
No crosshead pins—
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Every part possible that might cause trouble has been eliminated. And for that reason "Daytons" require the very minimum of parts adjustment or replacement.

There are 28 different models of Dayton Air Compressors ranging in price from $120 to $600. Catalogs and bulletins are yours for the asking. Address your correspondence to

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NATURAL GASOLINE

Grades A · AA · B · BB · C
CONTRACT OR SPOT

WILLOCK OIL CORPORATION
First National Bank Building · Phone Atlantic 3110
PITTSBURGH, PA.
52 Years Experience · It Counts

market and ordering out a small amount on contract.

One Oklahoma refinery executive has expressed the hope that the spot gasoline market will become stabilized around 8.50 cents, which would be in line with the net-back on the present marginal contracts. He declared that with the refinery price above 9 cents a gallon with present tank wagon markets the jobber is being pinched and the refiner is getting a wider profit. The 8.50-cent level, he said, would about balance the whole picture, giving the jobber and the refiner about an even break on profits.

Higher gravity gasolines were in slightly better demand due to the colder weather. Prices remained generally unchanged.

Natural Gasolines

The usual end of the month lull was shown by natural gasolines this week. Buyers showed little inclination to buy for 30-day delivery, yet spot demand was in sufficient volume on small lot sales to keep the bulk of production moving. No large sales were reported during the week.

Near the close of the week two or three manufacturers reported they were accumulating a little surplus but the consensus of opinion was that buying the next few days would prevent any material slack appearing in the market.

Kerosenes

With exporters showing no interest in the market, demand for kerosenes was light all week. Several refiners were still working on export orders, however, and stocks were not accumulating at more than a normal rate.

Prices in Oklahoma lost a little ground while north Texas refiners continued to obtain prices common in that district the past week or 10 days. The comparative scarcity of kerosene in the Louisiana and Arkansas districts has kept that market steady.

Distillates and Gas Oil

Shipping instructions for distillates already under contract have been sent in in larger volume. Spot demand also has been good, especially for the low flash and zero cold test straw color goods. Prices have shown no change.

Several buyers have been active in placing orders for both gas oil and distillates for shipment over December. The zero cold test straw color gas oil has been extremely scarce in Oklahoma for prompt shipment. While the dark zero gas oil has been more plentiful as far as actual production was concerned, goods for spot market requirements have been relatively scarce. Ordinary U. G. I. specification gas oil has been more plentiful in all areas.

Fuel Oils

Two or three refiners have been checking recently to determine what

is the basis of any new fuel oil contracts which might be in the process of completion. The check has revealed that little new contracting has been done to date.

Demand for fuels for both spot and 30-day shipment, meanwhile, has been sufficient to cause a draft on stocks. Prices for December delivery have been about in line with the spot market.

Neutral Oils, Cylinder Stocks, Wax

Oklahoma refiners report the demand for their neutral oils and cylinder stocks has been lighter the last few days. Bright stocks continued in good demand. Prices were unchanged. Wax was being quoted at 4.90 cents a pound, f.o.b. New Orleans, or 4.75 to 4.875 cents Group 3. Demand was lighter in most quarters.

Canada Asks Half of Short Wave Lengths

WASHINGTON, Dec. 3.—The Canadian government has added to the already heavy load of embarrassment the Federal Radio Commission is bearing in connection with applications for allotment of short wave length channels, in which the oil industry is interested.

It has demanded, as a condition precedent to its going into a conference on the subject of the allocation of wave lengths, that the United States body admit that Canada is entitled to half the wave lengths.

In other words Canada thinks that, before anything can be done by the two governments toward bringing about an orderly use of the air, the United States shall agree that about 10,000,000 Canadians are entitled to as much use of the air as the 115,000,000 inhabitants of the United States.

The Federal Radio Commission is not prepared to assent to that. Therefore, what the diplomats call an "impasse" is in full operation. Canada did not even ask what the United States thought of suggesting.

This condition, it is believed, has added to the "sales resistance" of the commission in the matter of granting licenses to oil companies and geophysicists who work for oil companies. It is believed that Canada's demand, made in the manner indicated, will give the commissioners inclining to vote no an additional "reason" for refusing the applications of the oil companies and geophysicists.

R. R. Irwin Injured

TULSA, Dec. 3.—R. R. Irwin, vice president of the White Eagle Oil & Refining Co., was painfully injured when kicked by a horse on Nov. 24 while he was attending the American Royal Show at Kansas City.

Chicago Resale Market

Gasoline Market Is Unsettled

Staff Special

CHICAGO, Dec. 1

THE Chicago resale market was in a highly unsettled condition as the week ended Dec. 1. The price range shown in the OILGRAM on 58-60 U. S. Motor gasoline was the widest spread of any in recent years. Sales were also reported under the prices shown in the OILRGAM. Some of the low priced gasoline was moving out of Oklahoma while the rest was moving from points outside Group 3 on a Group 3 freight basis and in every case was not coming up to U. S. Motor specifications.

The bulk of 58-60 U. S. Motor gasoline sales reported were at 8.75 to 9.25 cents up to Nov. 28 and at 8.50 to 9.25 cents thereafter. The 9.25-cent price represented sales made by the major Oklahoma refiners, most of whom are still quoting this figure. The rest of the Oklahoma refiners as well as the leading refiners outside Oklahoma were moving their goods at 8.50 cents and up. Several small Oklahoma refiners placed the bulk of their production in the hands of marketers at approximately .25 cent below the low range of the market.

Sales of U. S. Motor gasoline have been reported as low as 8 cents Group 3 freight basis. Some of these goods were moved out of Louisiana refineries to Michigan points where they have a favorable freight rate and gave the refinery a netback of better than 8.50 cents. Some distress gasoline of approximately 52 gravity was reported offered by a west Texas refiner on a basis of 7.50 cents f.o.b. refinery.

Jobbers in this territory continued their policy of buying only for their immediate requirements and were doing lots of "shopping around" before placing their orders, with special interest being paid to freight rates, the trade reported. In spite of this strict buying economy, the demand for U. S. Motor on the spot market was fairly good in most quarters, especially the first of the week. Contract buyers were ordering out most of their commitments, refiners said. Weather has permitted motoring and the roads in most of the Standard of Indiana territory are in good shape. However, heavy snow was reported on Nov. 29 in southern Nebraska and Iowa, and in northern Kansas. Light snowfall occurred in a few other parts of the territory.

Demand for higher gravity gasolines was fairly steady in several quarters, while other sellers reported doing little business. One seller said that demand for anti-knock gasolines was hurting his high test business. While the higher gravity gasolines did not fall off in price as sharply as U. S. Motor, nevertheless they were off approximately 0.25 cent on all grades.

The 60-62, 437 e. p. grade moved mostly at 9 to 9.50 cents Nov. 26, at 8.875 to 9.50 cents Nov. 27, and at 8.75 to 9.50 cents the remainder of the week. Bulk of movement of 60-62, 400 e. p. was at 9.625 to 9.75 cents the first half of the week and at 9.50 to 9.75 cents the latter half. The 64-66, 375 e. p. grade moved at 10.25 to 10.50 cents until Nov. 28 and at 10 to 10.50 cents thereafter.

Movement of kerosene was light all week although asking prices were unchanged over close of the previous week. Practically all sales of 41-43 w.w. kerosene were recorded at 5.625 to 5.75 cents, although a few were reported at 5.50 cents. One or two refiners who were practically out of the market were still quoting 6 cents.

Distributors of furnace oils reported doing a good business and most of them said their demand for these oils was far ahead of this time last year. Distillate appeared to be the popular favorite with the home burner owners, although gas oils and high gravity fuel oils were also enjoying a good play.

Distillate prices were firm and were showing a tendency to advance. One or two sellers advanced their prices from 3.375 to 3.50 cents on the 38-40 straw. Most sales of this grade were at 3.375 to 3.50 cents, with several sellers moving goods at 3.75 cents.

Gas and fuel oil prices were generally unchanged this week. Low cold test goods were bringing better prices in some quarters while heavy fuel oils were stationary. One refiner reported moving some 32-36 dark zero gas oil to a marketer at 3 cents, for shipment over December. Demand from industrial concerns for their December requirements of fuel were coming in satisfactorily, most sellers said, although no unusual demand was apparent.

Prices of gas and fuel oils were unchanged over those shown in NATIONAL PETROLEUM NEWS, issue of Nov. 28.

Mostly fair weather will prevail over most of Standard of Indiana territory next week. Temperatures will be below normal the first half of the week, and will rise near the end, says the Chicago weather bureau.

Refinery Markets on Light Oils and Lubricants

Prices given below are in cents per gallon, F. O. B. refinery, except where $ is shown

(These Refinery Prices compiled in the OIL PRICE HANDBOOK for a whole year)

GASOLINE AND NAPHTHA

OKLAHOMA (Weighted Average Prices)

	Prices Dec. 3	Prices Nov. 26	Prices Nov. 19
58-60 U.S. Motor, 437 e.p.	9.0680	9.1925	9.3163
60-62 437 e.p. gasoline...	9.1786	9.3750	9.5313
60-62 400 e.p. gasoline...	9.6250	9.8438	9.7500
64-66 375 e.p. gasoline...	10.7031	10.5625	10.7500

In this issue, all above weighted average prices are effective on Monday on the dates shown at the top of the columns.

THE above prices still reflect the attitude of the Oklahoma refiners reporting spot sales to NATIONAL PETROLEUM NEWS and Platt's OILGRAM to pass up spot business and let it go to other refining areas whose prices have been considerably under the spot prices prevailing in Group 3 proper. Oklahoma prices are fractionally lower than those of a week ago. This is due in part to the gradual lowering of quotations by several Oklahoma refiners and the narrowing of the wide range which has existed for the Mid-Continent as a whole.

The volume of goods which is moving from Oklahoma proper at prices which are lower than those reported and which have their proper weight in the compilation of the above weighted average prices, is relatively small and one or two refiners have advanced their prices more nearly in line with the range of prices which go to make up the weighted averages.

The better spot demand at present is reflected in the total cars of 58-60 U. S. Motor sold on the spot market the past two weeks. For the week of Nov. 17-23 inclusive 248 cars were sold as compared with 261 cars for the week of Nov. 24-30 inclusive despite this week having one holiday.

(The above weighted averages are made up from confidential daily reports of all gasoline spot market sales—for shipment in 10 days—from Oklahoma refineries only and representing 85.2 per cent of the state's refining capacity. The above prices do not include prices on sales for "over the month," for contracts, or to brokers or on shipments to company owned stations. Records of the reporting refiners are checked periodically to verify the accuracy of their reports.—Editor.)

OKLAHOMA	Prices Dec. 3	Prices Nov. 26	Prices Nov. 19
48-50 450 e.p. naphtha...	†8.25 – 8.50	†8.50 – 8.75	†8.75
50-52 450 e.p. naphtha...	†8.25 – 8.50	†8.50 – 8.75	†8.75
56-58 450 e.p. gasoline...	8.50 – 9.00	8.875– 9.125	8.875– 9.125
58-60 450 e.p. gasoline...	8.625– 9.125	9.00 – 9.25	9.00 – 9.25
64-66 390 e.p. gasoline...	10.00 –10.375	10.00 –10.375	10.00 –10.375
68-70 350-360 e.p. gasoline	10.75	10.75	10.75
PENNSYLVANIA			
52-54 Naphtha.....	9.25 –10.50	9.25 –10.50	9.50 –10.50
54-56 Naphtha.....	9.25 –10.50	9.25 –10.75	10.25 –10.50
58-60 U.S. Motor 437 e.p.	10.50 –11.00	10.50 –11.00	10.75 –11.25
60-62 400-410 e.p. gasoline	11.50 –12.00	11.00 –12.00	11.00 –12.00
64-66 390 e.p. gasoline...	12.25 –13.00	12.25 –13.00	12.00 –13.00
68-70 Str-run gas. 350-360 e.p.....	12.75 –13.50	13.25 –13.50	13.00 –13.50
OHIO (Quotation of S. O. Ohio.)			
58-60 U.S.Motor, delivered in Ohio, 3c tax to be added	11.75	11.75	12.25
KANSAS (F. O. B. refinery Kansas destination)			
58-60 U.S. Motor 437 e.p.	9.25 – 9.50	9.50	9.50
60-62 400 e.p. gasoline...	10.25	10.25	10.25
64-66 375 e.p. gasoline...	10.75 –11.00	10.75 –11.00	10.75 –11.00

NORTH TEXAS	Prices Dec. 3	Prices Nov. 26	Prices Nov. 19
48-52 450 e.p. naphtha...	†7.75 – 8.00	†8.50 – 8.75	†8.50 – 8.75
56-58 450 e.p. gasoline...	†8.00	†8.75	†8.75
58-60 450 e.p. gasoline...	†8.00	†8.75	†8.75
58-60 U.S. Motor 437 e.p.	8.25 – 8.75	9.00	9.00
60-62 400 e.p. gasoline...	9.25 – 9.50	9.25 – 9.50	9.25 – 9.50
64-66 390 e.p. gasoline...	9.75	9.75	9.75
64-66 375 e.p. gasoline...	10.00	10.00	10.00
68-70 350-360 e.p. gasoline	10.75	10.75	10.75
NORTH LOUISIANA (N. La., Ark. and Miss. destination)			
58-60 U.S. Motor gasoline	9.00 – 9.25	9.25	9.25
ARKANSAS (Arkansas destination only)			
56-58 450 e.p. gasoline...	8.50 – 8.75	8.50 – 8.75	8.50 – 8.75
58-60 450 e.p. gasoline...	9.00	9.00	9.00
58-60 U.S. Motor 437 e.p.	9.00 – 9.25	9.25	9.25
‡CALIFORNIA			
54-58 U.S. Motor 437 e.p.	9.00 –12.50	9.00 –12.50	9.00 –12.50
58-61 U.S. Motor 437 e.p.	10.00 –13.50	10.00 –13.50	10.00 –13.50
42-45 Eng. dis. 445-480 e.p.....	7.00 – 8.00	7.00 – 8.00	7.00 – 8.00

‡3c tax to be added to California gasoline prices if used in state.

NATURAL GASOLINE

(Note: End point of all grades, not over 375 F. Corrosion test adopted Oct. 1, 1927; A.S.T.M. Method D130-27T; doctor test, July 2, 1928.)

OKLAHOMA			
Grade AA, 80-87.9, 90% Recovery.....	8.875– 9.125	9.125	8.75 – 9.00
Grade A, 72-79.9, 90% Recovery.....	8.875– 9.125	9.125	8.75 – 9.00
Grade BB, 84-92, 85% Recovery.....	8.50	8.50 – 8.625	8.375– 8.50
Grade B, 76-83.9, 85% Recovery.....	8.50	8.50 – 8.625	8.375– 8.50
Grade C, 80-92, 78% Recovery.....	8.50	8.50	8.25 – 8.375
NORTH TEXAS (F. O. B. Breckenridge)			
Grade AA, 80-87.9, 90% Recovery.....	8.875– 9.125	9.125– 9.25	8.75 – 9.00
Grade A, 72-79.9, 90% Recovery.....	8.875– 9.125	9.125– 9.25	8.75 – 9.00
Grade BB, 84-92, 85% Recovery.....	8.50	8.50 – 8.625	8.375 –8.50
Grade B, 76-83.9, 85% Recovery.....	8.50	8.50 – 8.625	8.375– 8.50
Grade C, 80-92, 78% Recovery.....	8.50	8.50	8.25 – 8.375
NORTH LOUISIANA (F. O. B. Monroe District)			
Grade AA.....	†9.25 – 9.50	†9.50 – 9.625	†9.25 – 9.50
Grade BB.....	†9.00	†9.00 – 9.125	†9.00
Grade C.....	†9.00	†9.00	†8.75 – 9.00
CALIFORNIA			
75-85, 375-390 e.p. blend	7.25 – 7.50	7.00 – 7.25	6.50 – 7.50

MOTOR FUEL BLENDS

OKLAHOMA			
64-66 Blend 437 e.p.....	8.75	8.75 – 9.00	8.75 – 9.25

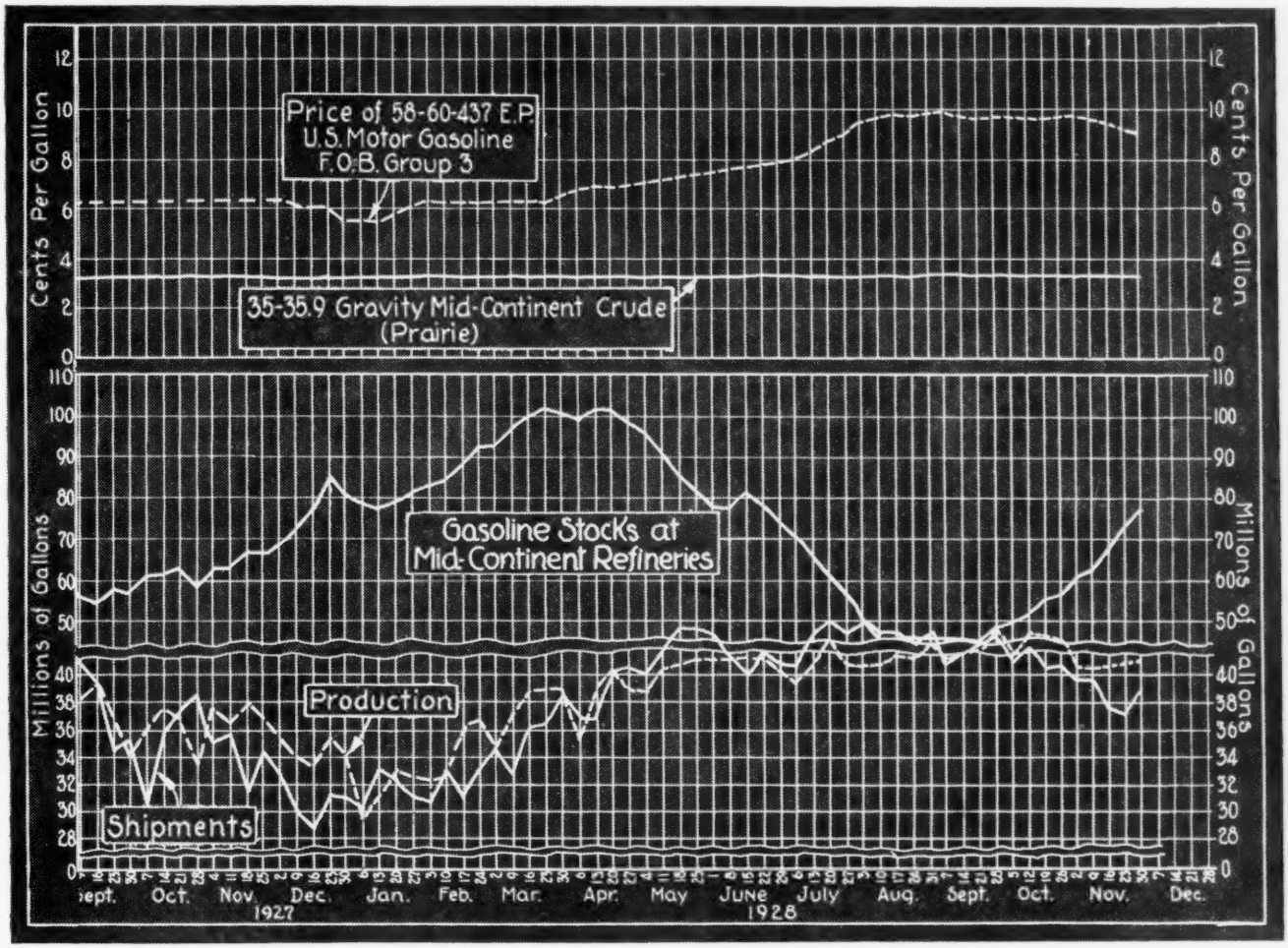
BURNING OILS

PENNSYLVANIA			
45 w.w. kerosene.....	7.25 – 7.625	7.25 – 7.625	7.25 – 7.625
46 w.w. kerosene.....	7.625– 8.00	7.50 – 8.00	7.625– 8.00
47 w.w. kerosene.....	8.00 – 8.25	7.875– 8.25	8.00 – 8.25
300 mineral seal.....	7.25 – 7.75	7.25 – 7.50	7.25
OKLAHOMA			
41-43 w.w. kerosene.....	5.75	5.75 – 5.875	5.75 – 6.00
42-44 w.w. kerosene.....	6.25	6.25 – 6.375	6.25 – 6.50
KANSAS (F. O. B. refinery Kansas destination)			
41-43 w.w. kerosene.....	6.00 – 6.25	6.00 – 6.25	6.125– 6.25
42-44 w.w. kerosene.....	6.50	6.50	6.50
NORTH TEXAS			
40-42 w.w. kerosene.....	5.50	5.50 – 5.625	5.625– 5.75
41-43 w.w. kerosene.....	5.75	5.75 – 5.875	5.875– 6.00

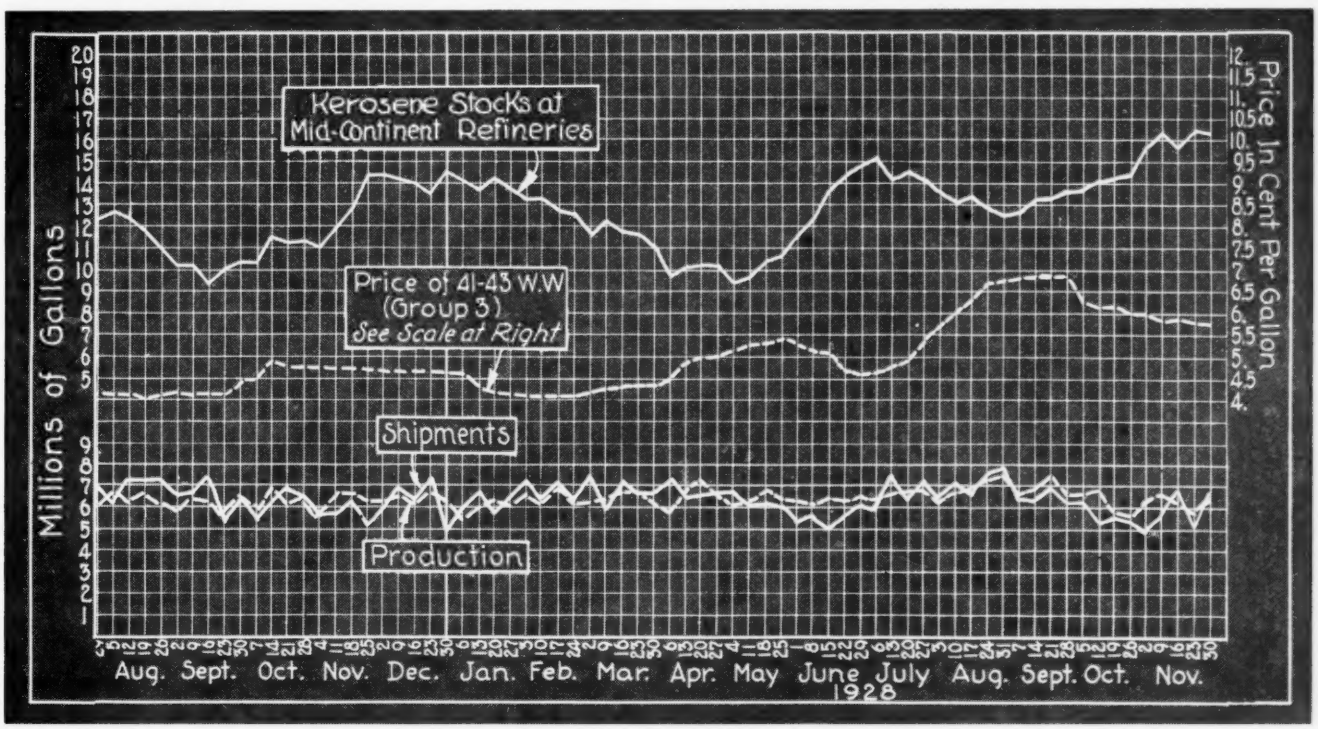
†Prices nominal ††Only one refiner quoting *Quotations only **Represents both sales and quotations

Barometer of Mid-Continent Refinery Market—Week Ending November 30

Charted Course of Prices, Production, Shipments, Stocks of Principal Refined Products, Week by Week, From Reports Made by 81 Plants to National Petroleum News



Prices shown above are extended to date shown in Refinery Market and Crude tables in Market section of this issue and stocks, shipments and Production are extended to date as shown in the table on the opposite page



Refinery Markets on Wax, Lubricants and Heavy Oil Products

Prices given below are in cents per gallon, F. O. B. refinery, except where $ is shown

(For quick reference to Refinery Prices, get the OIL PRICE HANDBOOK, published annually)

BURNING OILS (*Continued*)

	Prices Dec. 3	Prices Nov. 26	Prices Nov. 19
NORTH LOUISIANA	**(N. La., Ark. and Miss. destination)**		
41-43 w.w. kerosene.....	6.75	6.75	6.75
ARKANSAS (Arkansas destination only)			
42-44 kerosene.....	6.75 – 7.00	6.75 – 7.00	6.75 – 7.00
CALIFORNIA			
38-40 w.w. kerosene.....	6.25 – 7.00	6.25 – 7.00	6.25 – 7.00

NEUTRAL OIL

PENNSYLVANIA			
Vis.	**(Viscosity at 70°F.)**		
200 No. 3 Assoc. Filt.....	28.00 –29.00	28.00 –29.00	28.00 –29.00
180 No. 3 Assoc. Filt.....	24.00 –27.00	24.50 –27.00	25.00 –27.00
150 No. 3 Assoc. Filt.....	22.50 –23.00	21.00 –23.00	21.50 –23.00
	(Non Viscous)		
34 Grav. 330-340 Flash.	7.25 – 9.00	7.25 – 8.00	7.25 – 9.00
36 Min. Neut., 300-305 Flash.....	7.50 – 8.00	7.50 – 8.00	6.75 – 7.75
****OKLAHOMA**			
Vis. Color	**(Viscosity at 100°F.)**		
100—No. 2.....	5.50 – 6.50	5.50 – 6.50	5.50 – 6.50
150—No. 3.....	7.50 – 8.50	7.50 – 8.50	7.50 – 8.50
150—No. 4.....	6.50 – 7.50	6.50 – 7.50	6.50 – 7.50
180—No. 3.....	8.50 – 9.50	8.50 – 9.50	8.50 – 9.50
180—No. 4.....	8.75 – 9.75	8.75 – 9.75	8.75 – 9.75
180—No. 5.....	8.50 – 9.50	8.50 – 9.50	8.50 – 9.50
200—No. 3.....	9.00 –10.00	9.00 –10.00	9.50 –10.25
200—No. 4.....	9.25 –10.00	9.25 –10.00	9.25 –10.00
200—No. 5.....	8.50 – 9.50	8.50 – 9.50	8.50 – 9.50
220—No. 3.....	12.50 –13.50	12.50 –13.50	12.50 –13.50
220—No. 4.....	12.25 –12.50	12.25 –12.50	12.25 –12.50
220—No. 5.....	11.50 –12.00	11.50 –12.00	11.50 –12.00
240—No. 3.....	13.00 –13.50	13.00 –13.50	13.00 –13.50
240—No. 4.....	12.00 –13.00	12.00 –13.00	12.00 –13.00
240—No. 5.....	11.00 –13.00	11.00 –13.00	11.00 –13.00
280—No. 3.....	14.00 –15.50	14.00 –15.50	14.00 –15.50
280—No. 4.....	13.00 –14.50	13.00 –14.50	13.00 –14.50
280—No. 5.....	12.00 –14.00	12.00 –14.00	12.00 –14.00
300—No. 5-6.....	15.00 –17.00	15.00 –17.00	15.00 –17.00
GULF COASTAL			
Vis. Color	**(Viscosity at 100°F., pour test 0)**		
100—No. 2 Unfilt. Pale..	7.00 – 7.50	7.00 – 7.50	7.00 – 7.50
200—No. 3 Unfilt. Pale..	10.00 –10.75	10.00 –10.75	10.00 –10.75
300—No. 3 Unfilt. Pale..	11.00 –11.75	11.00 –11.75	11.00 –11.75
500—No. 3½ Unfilt. Pale	12.50 –13.50	12.50 –13.50	12.50 –13.50
750—No. 4 Unfilt. Pale..	15.50 –16.00	15.50 –16.00	15.50 –16.00
200—No. 5½ Red Oil....	8.50 – 9.00	8.50 – 9.00	8.50 – 9.00
300—No. 5½ Red Oil....	9.25 – 9.75	9.25 – 9.75	9.25 – 9.75
500—No. 6 Red Oil.....	10.50 –11.25	10.50 –11.25	10.50 –11.25
750—No. 6 Red Oil.....	13.50 –14.00	13.50 –14.00	13.50 –14.00
CALIFORNIA			
Vis. Color	**(Viscosity at 100°F.)**		
100—No. 3.....	9.50 –10.00	9.75 –10.00	9.75 –10.00
200—No. 3.....	11.50	11.50 –12.00	11.50 –12.00
300—No. 3.....	13.00	13.00 –13.50	13.00 –13.50
450—No. 3.....	15.50	15.50 –16.00	15.50 –16.00
550—No. 3.....	16.50	16.50 –17.00	16.50 –17.00
600—No. 3.....	17.00	17.00 –17.50	17.00 –17.50
200—No. 5.....	11.00	11.00 –11.50	11.00 –11.50
300—No. 5.....	12.00	12.00 –12.50	12.00 –12.50
400—No. 5.....	14.00	14.00 –14.50	14.00 –14.50
500—No. 5.....	15.00	15.00 –15.50	15.00 –15.50
600—No. 5.....	16.00	16.00 –16.50	16.00 –16.50
700—No. 7.....	18.00	18.00 –18.50	18.00 –18.50

CYLINDER STOCKS

****OKLAHOMA**			
190-200 Vis.at 210° Brt. St.	31.00 –32.00	31.00 –32.00	31.00 –32.00
150-160 Vis.at 210° Brt. St.	27.00	27.00	27.00
600 E.St. 140-150 Vis.-210°	17.50 –18.00	17.50 –18.00	17.00 –18.00
600 St. Ref. Olive Green..	7.50 –10.00	7.50 –10.00	7.50 –10.00
600 St. Ref. Dark Green..	6.00 – 8.00	6.00 – 8.00	6.00 – 8.00
Black Oil.....	5.00	5.00	5.00
PENNSYLVANIA	**(1-inch Immersion Test)**		
600 Steam Refined.....	18.00 –19.00	17.00	14.50 –16.00
650 Steam Refined.....	22.00 –23.00	20.00	16.50 –19.00
600 Flash.....	25.00	22.50 –24.00	22.00
625 Flash.....	32.00 –39.00	33.00 –35.00	31 00 –32.00
600 Warren E.....	20.00 –21.50	19.50 –21.00	19.00 –19.50
600 Oil City E.....	19.00 –20.50	18.00 –19.00	17.00 –19.00
600 D Filtered.....	25.50 –26.00	25.00	25.00
Cold Test Stock, 40-50p. p., 140-150 vis. at 210° 540-550 flash, No. 8 color	35.50 –37.00	34.00 –35.50	33.50 –35.50
40-50 p.p., 140-150 vis. at 210°, 540-550 flash, No. 6-6½ color diluted....	33.50 –35.00	33.50	32.00 –33.50

WAX

	Prices Dec. 3	Prices Nov. 26	Prices Nov. 19
PENNSYLVANIA	**Per pound, New York**		
122-124 white crude scale	5.125– 5.25	5.00 – 5.25	5.00 – 5.25
124-126 white crude scale	5.25 – 5.375	5.125– 5.25	5.00 – 5.25
OKLAHOMA			
**124-126 White Crude Scale.....	4.75 – 4.875	5.00 – 5.125	5.00 – 5.125
CALIFORNIA			
White crude scale, per pound, ton lots.....	6.00 – 6.50	6.00 – 6.50	6.00 – 6.50

FUEL OIL

PENNSYLVANIA	**(For outside Pittsburgh district)**		
36-40 fuel oil.....	4.75 – 5.00	4.625– 5.00	4.50 – 5.00
30-34 fuel oil.....	4.50 – 4.75	4.375– 4.50	4.25 – 4.50
28-32 fuel oil.....	4.50 – 4.75	4.375– 4.50	4.25 – 4.50
OKLAHOMA			
38-40 straw distillate.....	3.375– 3.50	3.375– 3.50	3.375– 3.50
36-38 straw distillate.....	3.25 – 3.375	3.25 – 3.375	3.25 – 3.375
32-36 gas oil, straw.....	‡2.625– 2.875	‡2.625– 2.875	‡2.625– 2.875
32-36 dark gas oil.....	‡2.50 – 2.75	‡2.50 – 2.75	‡2.50 – 2.75
28-30 fuel oil (in bbls.)...	$0.85 – 0.90	$0.85 – 0.90	$0.85 – 0.90
26-28 fuel oil (in bbls.)...	$0.675– 0.725	$0.675– 0.725	$0.675– 0.725
24-26 fuel oil (in bbls.)...	$0.625– 0.675	$0.65 – 0.675	$0.65 – 0.675
22-26 fuel oil (in bbls.)...	$0.55 – 0.625	$0.55 – 0.625	$0.55 – 0.625
18-22 fuel oil (in bbls.)...	$0.55 – 0.60	$0.55 – 0.60	$0.55 – 0.60
16-18 fuel oil (in bbls.)...	$0.55	$0.55	$0.55
14-16 fuel oil (in bbls.)...	$0.525– 0.55	$0.525– 0.55	$0.525– 0.55

‡Zero cold test gas oil sells for 0.125 to 0.25 cent higher.

KANSAS	**(F. O. B. refinery Kansas destination)**		
38-40 straw distillate.....	3.50 – 3.625	3.50 – 3.625	3.50 – 3.625
36-38 straw distillate.....	3.25 – 3.375	3.25 – 3.375	3.25 – 3.375
32-36 gas oil.....	2.75 – 2.875	2.75 – 2.875	2.75 – 2.875
24-26 fuel oil.....	*$0.75 – 0.80	*$0.75– 0.80	*$0.75 – 0.80
18-22 fuel oil.....	*$0.70	*$0.70	$*0.70
NORTH TEXAS			
38-40 straw distillate.....	3.25 – 3.375	3.25 – 3.375	3.25 – 3.375
32-36 gas oil, cracked....	2.375– 2.50	2.375– 2.50	2.50
32-36 St. reduced gas oil..	2.375– 2.50	2.375– 2.50	2.50
24-26 fuel oil (in bbls.)...	$0.525– 0.55	$0.525– 0.55	$0.55
GULF COASTAL			
Fuel (in bbls.).....	$1.20 –$1.25	$1.20 –$1.25	$1.20 –$1.25
Gas oil.....	4.375– 4.50	4.375– 4.50	4.375– 4.50
NORTH LOUISIANA	**(N. La., Ark. and Miss. destination)**		
32-36 gas oil, dark.....	3.00	3.00	3.00
32-36 gas oil, straw.....	3.00 – 3.25	3.00 – 3.25	3.00 – 3.25
16-20 fuel oil (in bbls.)...	$0.70	$0.70	$0.70
ARKANSAS	**(Arkansas destination only)**		
32-36 gas oil, straw.....	3.00 – 3.25	3.00 – 3.25	3.00 – 3.25
32-36 gas oil.....	3.00	3.00	3.00
28-32 gas oil.....	2.75	2.75	2.75

CALIFORNIA (F. O. B. San Joaquin Valley. At San Francisco, 4c per bbl. more)

14-18 fuel oil (per bbl.)...	$0.60 –$0.70	$0.60 –$1.00	$0.60 –$1.00
14-18 Bunker oil (per bbl.)	$0.70 –$1.00	$0.70 –$1.00	$0.70 –$1.00
30-34 gas oil (per bbl.)....	$1.00 –$1.15	$1.00 –$1.20	$1.00 –$1.20
27 Plus Diesel oil (per bbl.)	$0.90 –$1.00	$0.90 –$1.00	$0.90 –$1.00

PETROLATUMS

PENNSYLVANIA (In barrels, carload lots, f.o.b. refinery. In tank cars ½c to ¾c per pound less.) Two refiners quoting.

Snow White.....	8.50 – 8.625	8.50 – 8.625	8.50 – 8.625
Lily White.....	7.625	7.625	7.625
Cream White.....	6.625	6.625	6.625
Light Amber.....	3.625– 3.875	3.625– 3.875	3.625– 3.875
Amber.....	3.375– 3.50	3.375– 3.50	3.375– 3.50
Red.....	3.125– 3.25	3.125– 3.25	3.125– 3.25

PETROLEUM COKE

****OKLAHOMA**

(Per ton in car lots)

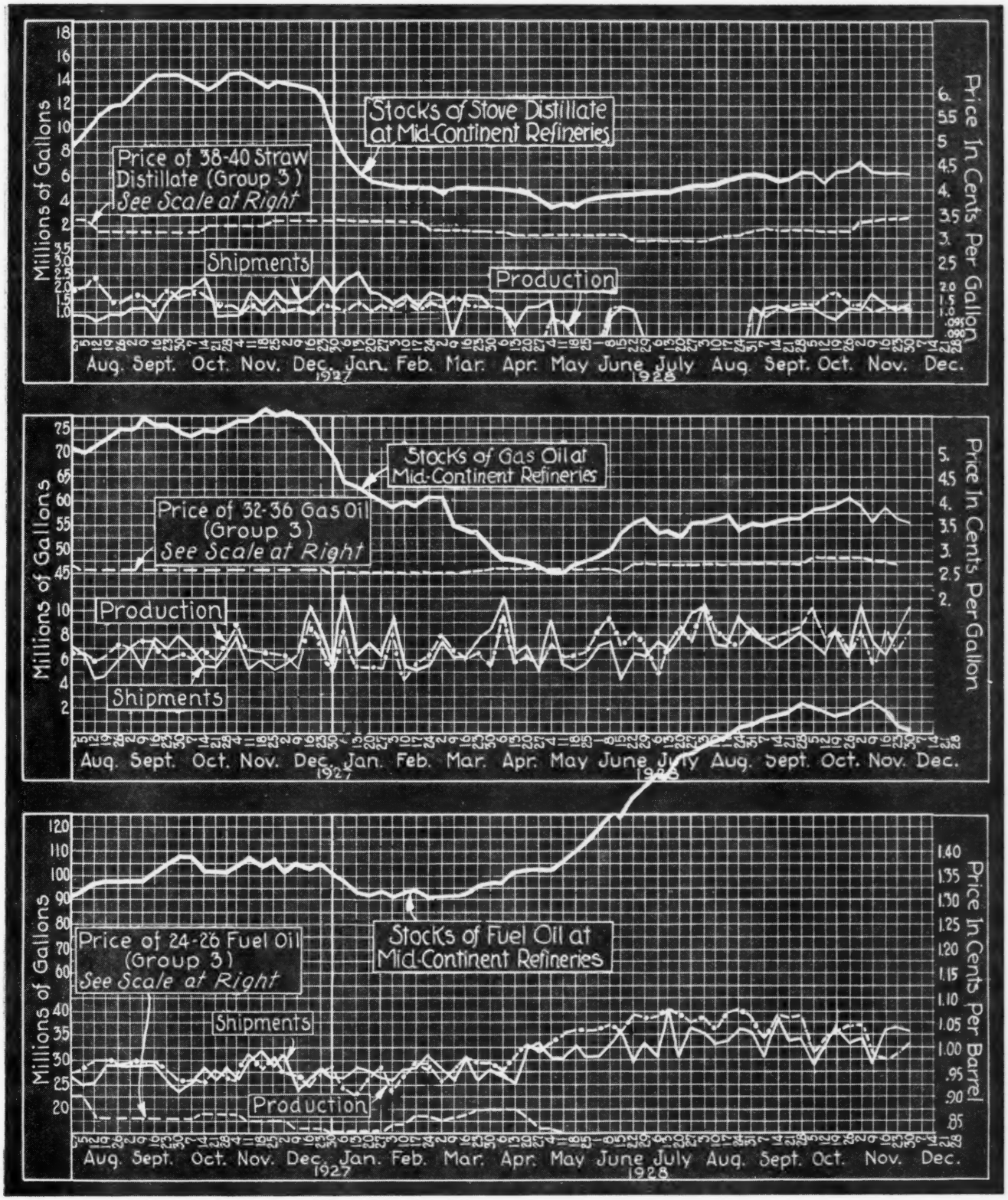
Lump.....	$4.50 – 5.00	$4.50 – 5.00	$4.50 –$5.00
Still run.....	$3.00	$3.00	$3.00
Breeze.....	$2.00	$2.00	$2.00

†Prices Nominal ††Only One Refiner Quoting *Quotations only **Represents Both Sales and Quotations

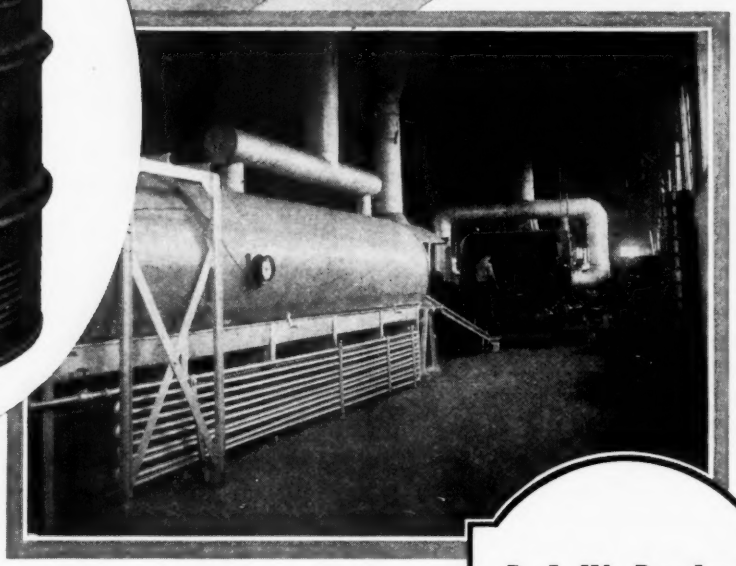
Barometer of Mid-Continent Refinery Market

Week Ending November 30

Charted Course of Prices, Production, Shipments, Stocks of Principal Refined Products, Week by Week, From Reports Made by 81 Plants to National Petroleum News


Millions of Gallons
Price In Cents Per Gallon
Stocks of Stove Distillate at Mid-Continent Refineries
Price of 38-40 Straw Distillate (Group 3) See Scale at Right
Shipments
Production
Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1927
1928
Millions of Gallons
Price In Cents Per Gallon
Stocks of Gas Oil at Mid-Continent Refineries
Price of 32-36 Gas Oil (Group 3) See Scale at Right
Production
Shipments
Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1927
1928
Millions of Gallons
Price In Cents Per Barrel
Price of 24-26 Fuel Oil (Group 3) See Scale at Right
Stocks of Fuel Oil at Mid-Continent Refineries
Shipments
Production
Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1927
1928

P.I.W.
STEEL BARRELS



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Favorable impressions turn the sale to one product or another in a surprising number of cases, and for a good reason. Pride in the appearance of your product as it reaches the user reflects a similar pride in manufacture that commends your product to any buyer.

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P.I.W. Barrels and Drums can be supplied in any combination of color. The enamel finish is baked on, assuring the lasting good looks of the package, even after much handling. And the cost is no higher than you are accustomed to paying for a less attractive package.

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P. I. W. Products

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G-E-M BILGED STEEL BARRELS
PENNSYLVANIA TANK CARS
STILLS—6 IN. THICK WALLS
OIL REFINING EQUIPMENT
PRESSURE VESSELS
VACUUM VESSELS
AGITATORS
CHEMICAL PROCESSING EQUIPMENT
OIL STORAGE TANKS UP TO 120,000 BARRELS CAPACITY
ELEVATED WATER TANKS
PRESSURE PIPE LINES
PENSTOCKS
AUTOCLAVES
KILNS
DRYERS
ANNEALING BOXES
DIGESTERS
RETORTS
SPHERICAL VESSELS
BLAST FURNACE EQUIPMENT
CREOSOTING CYLINDERS
GALVANIZING KETTLES
EXCHANGERS
SMOKESTACKS
GENERAL STEEL PLATE CONSTRUCTION

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Pennsylvania Market

Cylinder Stocks Sold Out

CLEVELAND, Dec. 3.—Active buying of unfiltered cylinder stocks during the last 10 days has taken many western Pennsylvania refiners out of this market until Jan. 1.

Refiners generally were not seeking open market business but have laid aside sufficient production to care for regular customers. Those refiners with unfiltered stocks in the open market were quoting 18 to 19 cents on 600; 22 to 23 cents on 650; 25 cents on 600 flash; and 32 to 39 cents on 625 flash stocks. Buying was brisk last week and on Tuesday most of the refiners were sold up.

Export buyers continued to be active in the bright stock market. Quotations on light bright have advanced to 35.50 to 37 cents and on dark bright 33.50 to 35 cents. Exporters were buying both light and dark stocks. One refiner reported domestic buying has not been brisk.

Viscous neutrals continued to feel the quickening of the market; especially the 150 grade. The 150 grade is quoted at 22.50 to 23 cents, with the 180 and the 200 quotations unchanged.

U. S. Motor gasoline now is quoted at 10.50 to 11 cents. The prevailing market in late November was 10.50 cents to the brokers and 10.75 to 11 cents to the distributor, with occasional sellers asking only 10.50 cents from the trade. The 10.50 cent price became general Saturday and today.

Gasoline demand continued to be fair, refiners reported. Week end gallonage was good at his company owned stations, one refiner said. Higher gravity gasolines were unchanged.

Some refiners had advanced their kerosene prices within the current price ranges. Demand has been good.

Fuel oil quotations have advanced to a bottom price on 36-40 of 4.75 cents; and on 30-34 and 28-32 of 4.50 cents.

California Market

Natural Gasoline Active

LOS ANGELES, Dec. 1.—Natural gasoline in California continues to show strength, especially for spot movement, in spite of the fact that production of this product is showing an increase every month.

Early in November it was possible to buy some natural gasoline in tank cars at 6.50 to 7 cents. Buyers this week were not able to secure quotations under 7.25 cents while most of the sellers wanted 7.50 cents or even more.

Utilization of natural gasoline in California in October amounted to 1,170,855 barrels, an increase of 202,087 barrels over September. This gives a daily average utilization of 37,770 barrels against a daily average production of 37,161 barrels.

This product after being blended with 25 per cent U. S. Motor is now being exported and one company is making contracts for 25,000,000 gallons over a year's period, to be exported.

U. S. Motor is being quoted at 8 to 8.25 cents for export although there is only one company that welcomes this business. Considerable 400 end point gasoline is being sold for export at approximately 9 cents. Two cargoes of 375 end point gasoline recently moved from Los Angeles harbor to the Gulf. The price paid was not made public.

Gasoline is moving to out of state points at 9 to 9.50 cents. Most of this spot business is in the hands of independent refiners and many of them are asking the top figure. Although quotations for gasoline shipments for points within the state continue at 10.50 to 12.50 cents without tax, there is very little obtainable at 10.50 cents. Most of the refiners are asking 11 cents and up.

There is no real change in the fuel oil market with the independent refiners willing to sell in tank cars at 60 to 65 cents while those in position to export are asking about 70 cents.

Wax Market

Demand More Active

NEW YORK, Dec. 1.—Export wax markets, after spending most of the past week in the doldrums, were brought to life Friday by a better demand for spot goods. White crude scale was being rather actively bid for in the New York market and there was the usual first-of-the-month buying of the fully refined grades.

One large refiner reported receiving a firm offer of 5.125 cents a pound for a good size quantity of white crude scale Saturday. His stocks, he reported, were rather comfortably situated despite the quiet market that has prevailed for the past two months and he was a bit doubtful as to whether or not he would lower his quotation of 5.25 cents which he has held to throughout the dull period.

A buyer reported bidding 5.05 cents a pound for a small lot of white crude scale Saturday and was unable to secure his requirements.

Prices for the fully refined grades were generally unchanged with 125-127 A.m.p. quoted at a minimum of 5.75 cents a pound. Several sellers were quoting 5.875 cents.

The New Orleans market was generally quiet and prices of all grades of scale and fully refined were unchanged.

Distillation—Fractionation

Fifty-three articles since the first of the year have been published in *National Petroleum News* on the subject of increasing yield of products—improving their quality—reducing manufacturing costs—equipment design—

This averages a little more than one article per issue on this one phase of refinery operation. For your file reference we list them below:

1928

Motor oil specified on resistance to distillation Oct. 3, p. 90
Better fractionating equipment saves heat Sept. 26, p. 91
How a refinery cut costs in half Sept. 19, p. 22
Gravity, volume corrections for temperature Sept. 5, p. 110; Sept. 19, p. 74
Gas and gasoline analysis in plant control Sept. 5, p. 79
Narrow distillation range oils best for absorption Aug. 8, p. 54
Distillation test in determining vapor pressure Aug. 1, p. 58
Light fractions from stabilizer July 25, p. 21
How important oil tests are applied Aug. 22, p. 81; Aug. 15, p. 73; Aug. 1, p. 80; July 25, p. 29; July 18, p. 26; July 11, p. 60
Improving efficiency of shell stills July 11, p. 69
Gasoline recovery from gases, Bayer charcoal process July 4, p. 67; June 27, p. 97
Zilwaukee refinery adapted to small field June 20, p. 23
Vertical steam still for fat oil distillation June 6, p. 37
Saves $80,000 yearly with auxiliaries June 6, p. 32
Fractionation theory and practice May 23, p. 102
Careful refining and selling build trade May 23, p. 56
Distillation process control by laboratory May 16, p. 57
Cutting costs in steam raising May 16, p. 49; May 9, p. 49; May 2, p. 17
New types of distilling equipment May 9, p. 76
Halves fuel costs with old shell still May 2, p. 81
Pipe still economy in making Penna. lubes May 2, p. 56
Good products at low cost Apr. 25, p. 85; Apr. 18, p. 61; Apr. 11, p. 54
Careful fractionation cuts costs Apr. 25, p. 48
Neutralizing lube oils with ammonia Apr. 11, p. 111
Bigger profits for refiners in 1928 Apr. 11, p. 28; Apr. 4, p. 25; Mar. 28, p. 28; Mar. 14, p. 42
Natural gasoline industry must make new products Apr. 4, p. 74; Feb. 1, p. 49; Jan. 25, p. 17
Technical control of refinery processes Mar. 14, p. 144; Mar. 7, p. 51; Feb. 29, p. 76
Shell still as big volume distilling unit Mar. 7, p. 60; Feb. 29, p. 63
New device burns sludge coke under boilers Mar. 7, p. 101
Refinery engineers discuss combustion-distillation Feb. 29, p. 21
Acid sludge disposal unsolved refinery problem Feb. 22, p. 75
Method for removing all wax from lube oil Feb. 8, p. 22
Increasing still capacity without capital outlay Jan. 25, p. 73
New equipment results in first profit in 7 years Jan. 25, p. 23

The above list of articles is for your convenience in locating them in your file.

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National Petroleum News
Main Office: 1213 West Third St.
Cleveland, Ohio

New York Domestic Market

Demand Quiet; Prices Unchanged

Staff Special
NEW YORK, Dec. 1

EASTERN gasoline markets were featureless during the week ended Dec. 1. Jobbing demand was reported on a minimum scale. No price changes were noted at any point along the Atlantic seaboard.

Markets in the northern districts, particularly New York harbor and Philadelphia, were rife with rumors of price shading, but these all lacked confirmation with principals said to be involved. Occasional transactions involving small lots which sold at slightly less than the quotations asked by the major companies were brought to light, but the sellers themselves considered them distress sales.

Open price reductions, which the trade generally expected the major companies would announce on Dec. 1, failed to materialize. In a good many quarters it was felt such action would stimulate jobber buying to some extent. They felt it would at least tend to break them away from the day-to-day buying policy most of them have adhered to rigidly for the past two or three weeks.

In searching about for a bright spot in current markets, several of the trade pointed to the status of the present market as compared with a year ago. U. S. Motor gasoline was selling at 8 cents in New York harbor during the first week of December, 1927, and while most sellers admitted they are not getting the volume of sales now that they would like, they concluded they were fortunate to be getting 3 cents a gallon more than they were a year ago.

For nearby delivery, in other words for shipment into the normal territory of New York harbor, sellers reported they were getting a minimum of 11 cents a gallon for U. S. Motor gasoline, and reports received from the local jobbing trade seemed to bear these statements out for the most part.

It was for shipment to distant territory that New York harbor sellers apparently were shading prices to compete with Baltimore and Philadelphia. This business, although rather large in volume, was small in comparison to the volume of goods going into the normal territory.

One Philadelphia refiner, who usually ships well over 100 cars of California gasoline a month into the Pittsburgh district, reported that he had shipped 5 cars during the whole month of November. To meet the competition from New York harbor he would have had to quote 10.75 cents f.o.b. Philadelphia. The netback at New York harbor on this basis is approximately 0.25-cent less.

Another large seller in the Philadelphia district asserted he had lost a Buffalo account which takes approximately 50 cars of gasoline a month due to his unwillingness to better his quotation of 10.75 cents, f.o.b. his plant. He had made this price anticipating the market for December would be off 0.25-cent.

One important seller in New York harbor also anticipating the market for December would be off 0.25-cent reported he had lost an order for 45 cars of U. S. Motor gasoline by his refusal to shade 10.75 cents.

New England markets, according to jobbers as well as sellers, were holding up remarkably well despite the reductions in wholesale and retail markets made by the Standard Oil Co. of New York and Atlantic Refining Co.

Sellers in the Boston and Providence districts were quoting a minimum of 12.75 cents, delivered, for U. S. Motor gasoline in tank cars. Posted tank wagon in New England districts now stands at 17 cents, exclusive of state taxes, but jobbers reported 2 to 3-cent concessions were necessary to get any business.

Burning oil prices were generally unchanged over last week. Kerosene demand was steady with water white selling at 9 cents and prime white available 0.25-cent cheaper in New York harbor.

Spot demand for furnace oil was on the increase with most sellers asking 6.50 cents, f.o.b. refinery. Goods were available at 6.25 cents in the Boston district.

The posted price for Grade C bunker oil was unchanged at $1.05 a barrel, f.o.b. terminals. Some shading of this price by smaller companies was reported.

Gulf Export Market

Gasoline Prices Lower

Staff Special
NEW YORK, Dec. 1

GASOLINE prices at the Gulf were definitely lower as the week ended. Interest on the part of foreign buyers was spasmodic, with tentative inquiries being circulated among export suppliers at frequent intervals but few of them developing any actual business.

The element of uncertainty of gasoline prices, which has been prevalent for approximately three weeks, in the Gulf export market, was as marked throughout the most of this week until Saturday when purchases for the accounts of two large French buyers were disclosed. One, an open market transaction, was considered fairly representative of the general market. The other, an inter-company transaction and in which prices were much in line with the price-ideas of most suppliers, was given but little consideration by the trade.

United States suppliers generally report they are far from being in a distress position, in fact at least four of the major companies continue to report they are not interested in the market with prices at their present levels. Easiness of the market is laid mostly to the extremely light foreign buying for the season. Purchases for December and January loading have run far below normal. Stocks of gasoline abroad, according to reports received from the other side, are low, and the trade feels it is only a matter of a short time now until there will be a renewal of active buying.

With little distress goods in the market, several suppliers have expressed the opinion that foreign buyers may be surprised to see prices take a turn in the opposite direction when they begin to build up their stocks for early spring consumption. In fact, they said, the turning point may not be far off. Prices, they feel, may ease off a 0.25 to 0.5-cent further, but it wouldn't take an overly large volume of buying to clean up the few cargoes that one or two suppliers would like to move.

In several quarters, the opinion is expressed that foreign buyers may take the lower prices paid Saturday as their cue to reinstate their tentative inquiries, or "market feelers," as they are coming to be called, definitely next week. At any rate, the trade is looking forward to next week's developments with great expectancy.

The purchase by a large French buyer Saturday from a leading refiner showed rather distinctly the trend of the current market. The buyer, incidentally, is the subsidiary of another large United States refiner

and his action in seeking his requirements in the open market seemed to bear out statements made by the parent company that it is not interested in the market with prices where they are.

Approximately 55,000 barrels of gasoline and kerosene were included in the purchase with 64-66, 375 end point gasoline and prime white kerosene the largest factors. There was some question among the trade Saturday about the prices paid, but those reported by the seller were as follows: U. S. Motor gasoline, 9.125 cents; 60-62, 390 end point gasoline, 10.75 cents; 64-66, 375 end point gasoline, 11 cents; prime white kerosene, 6.6875 cents. The cargo, although the prices are on an f.o.b. Gulf basis, is to be loaded from north Atlantic port between Dec. 15 and Jan. 15.

The seller in the foregoing transaction also sold its French subsidiary Saturday approximately 72,000 barrels of U. S. Motor and 64-66, 375 end point gasoline, prime white and water white kerosene for first half of January loading. Prices governing this transaction were not made public.

One large supplier, seldom active in the open market, was offering firm toward the end of this week a full and complete cargo of U. S. Motor gasoline at 9.125 cents for immediate acceptance. This supplier also offered a cargo of 390 end point gasoline at 10.875 cents early in the week, but later withdrew the offer.

Foreign interest in the heavy oil market at the Gulf was at a standstill and domestic buyers were only slightly more concerned. The sale of approximately 80,000 barrels of 32 plus gravity uncracked gas oil for coastwise movement was reported closed the early part of the week. The price reported paid was 3.875 cents a gallon. Suppliers indicated this price might be shaded 0.125 to 0.25-cent on lower gravity oil.

There were a few domestic inquiries in the market for cargoes of fuel oil. Suppliers were quoting $0.65 to $0.68 a barrel for bunker C in bulk and bunkering prices also were unchanged over last week. A New York broker reported negotiating the sale of a cargo of 17 gravity bunker C oil at $0.65 a barrel, f.o.b. Los Angeles Harbor.

Gulf Coast Lubes Steady

HOUSTON, Dec. 3.—Prices are unchanged in the Gulf Coastal lubricant markets. Shipments are normal for the season and manufacturers say conditions are generally satisfactory. There has been some increase in demand as compared with other years but no great change in the week-to-week situation.

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Graigrene *always* flows freely, even at 60° below zero. It provides that vital film of oil between swift moving surfaces all the time. It never channels. It gives positive protection—reduces friction to a minimum.

Engineers Advise Fluid Lubricant

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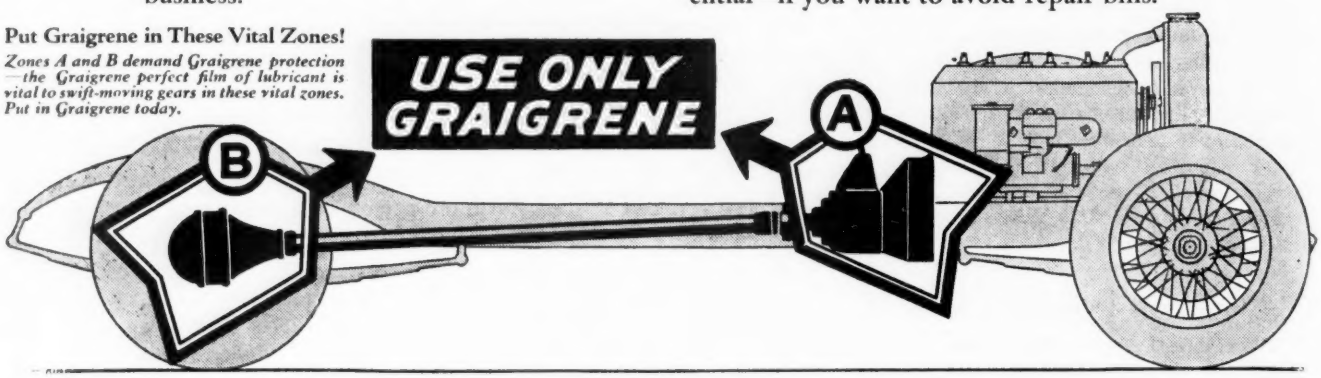
Tell your customers this story on cold mornings—

"Graigrene is fluid—always. It never packs at gear sides or freezes up, making gears hard to shift. It flows freely—penetrates every recess.

If the grease is stiff and solid, gears are hard to shift. How can they be lubricated properly under that condition? You need Graigrene in both transmission and differential—if you want to avoid repair bills."

Put Graigrene in These Vital Zones!

Zones A and B demand Graigrene protection—the Graigrene perfect film of lubricant is vital to swift-moving gears in these vital zones. Put in Graigrene today.



Manufactured by

Viscosity Oil Company

Established 1894

W. D. SIMMONS, President

Central Manufacturing District, CHICAGO

Phone Yards 7196

Complete Seaboard Market

(Export markets for whole year given in OIL PRICE HANDBOOK. Each volume carries refinery, tank wagon, crude and export markets—complete for the whole year)

Eastern Domestic Market

(Prices for tank car lots, f. o. b. refinery or seaboard terminal, representing majority of quotations.)

	Dec. 3	Nov. 26	Nov. 19
U. S. MOTOR GASOLINE			
New York harbor	11.00	11.00	11.00
Portland district	*13.25	*13.25	*13.25
Boston district	*12.75	*12.75	*12.75
Providence district	*12.75	*12.75	*12.75
Philadelphia district	11.00	11.00	11.00
Baltimore district	11.00	11.00	11.00
Norfolk district	11.00 –11.25	11.00 –11.25	11.00 –11.25
Charleston district	11.00 –11.25	11.00 –11.25	11.00 –11.25
Savannah district	11.00	11.00	11.00
Jacksonville district	11.00	11.00	11.00
CALIFORNIA U. S. MOTOR GASOLINE			
New York harbor	11.00 –11.25	11.00 –11.25	11.00
Philadelphia district	11.00	11.00	11.00
Baltimore district	11.00	11.00	11.00
WATER WHITE KEROSENE			
New York harbor	9.00	9.00	9.00
Philadelphia district	9.00	9.00	9.00
Baltimore district	9.00	9.00	9.00
GAS OIL: 28-34 Gravity			
New York harbor	4.75 – 5.00	4.75 – 5.00	4.75 – 5.00
Boston district	4.50 – 5.00	4.75 – 5.00	4.75 – 5.00
FURNACE OIL: 36-40 Gravity			
New York harbor	6.50	6.50	6.50
Boston district	6.00 – 6.50	6.25 – 6.50	6.25 – 6.50
GRADE C BUNKER OIL			
New York harbor	$1.05	$1.05	$1.05
Boston district	$1.05	$1.05	$1.05
DIESEL OIL			
New York harbor	$2.00	$2.00	$2.00
MEDICINAL OILS, RUSSIAN			
885-890 s.g., 325-330 vis.	$0.80 – 0.90	$0.80 – 0.90	$0.80 – 0.90
870-875 s.g., 150-155 vis.	$0.67 – 0.77	$0.67 – 0.77	$0.67 – 0.77
860-865 s.g., 80-85 vis.	$0.65 – 0.75	$0.65 – 0.75	$0.65 – 0.75

Note: Above gasoline prices do not include inspection tax levied in some states

*Minimum delivered.

New York Export Market

(Gasoline and kerosene in cases; in bulk. Lubricating oils are per gal. in bbls. Cylinder oils are Penna. products)

	Dec. 3	Nov. 26	Nov. 19
U. S. Motor gasoline	26.40	26.40	26.40
43-45 150 w.w. kerosene	18.90	18.90	18.90
42-44 110 s.w. kerosene	17.65	17.65	17.65
CYLINDER OILS			
Bright stock, dark	41.00 –42.00	40.00 –41.50	39.00 –41.00
600 D filtered	33.00	32.00 –33.00	32.00 –33.00
600 Warren E filtered	27.00 –28.00	26.00 –27.50	26.50 –27.50
600 s.r. unfiltered	25.00 –26.00	22.00 –24.00	21.00 –23.00
650 s.r. unfiltered	29.00 –31.00	24.50 –27.00	23.50 –26.00
600 flash, s.r.	32.00	30.00 –31.00	27.00 –29.00
630 flash, s.r.	39.00 –43.00	36.00 –40.00	36.00 –39.00
RED ENGINE OILS (Vis. 100°)			
300 vis. No. 6½ color	19.50	19.50	19.50
250 vis. No. 6 color	18.50	18.50	18.50
200 vis. No. 6 color	18.00	18.00	18.00
PALE ENGINE OILS (Vis. 100°)			
230 vis. No. 3¾ color	23.50	23.50	23.50
180 vis. No. 3¼ color	19.50	19.50	19.50
100 vis. No. 2¼ color	15.50	15.50	15.50
MOTOR OILS (Vis. 100°)			
600 vis. No. 7 color	34.50	34.50	34.50
500 vis. No. 6¼ color	32.50	32.50	32.50
400 vis. No. 7¼ color	30.50	30.50	30.50
300 vis. No. 6 color	29.50	29.50	29.50
200 vis. No. 3¼ color	20.00	20.00	20.00
MEDICINAL OILS			
875-885 s.g.	$0.80	$0.80	$0.80
865-870 s.g.	$0.70	$0.70	$0.70
WAXES (In cents per pound, f.a.s. carload lots)			
WHITE CRUDE SCALE (In barrels)			
122-124 A.m.p.	5.00 – 5.25	5.00 – 5.25	5.00 – 5.25
124-126 A.m.p.	5.00 – 5.25	5.00 – 5.25	5.00 – 5.25
FULLY REFINED (In burlap bags)			
123-125 A.m.p. Phila	5.75	5.75	5.75
125-127 A.m.p.	5.75 – 5.875	5.75 – 5.875	5.75 – 5.875
128-130 A.m.p.	6.00 – 6.25	6.00 – 6.25	6.00
130-132 A.m.p.	6.50	6.50	6.50
133-135 A.m.p.	7.25	7.25	7.25
135-137 A.m.p.	7.75	7.75	7.75
YELLOW CRUDE SCALE			
124-126 A.m.p.	4.875– 5.00	4.875– 5.00	4.875– 5.00

Gulf Export Market

(Prices are f. o. b. Gulf oil terminals in Texas and Louisiana, shipments of 20,000 bbls. and over unless otherwise noted, representing sellers' opinions, except those prices specified to the contrary)

	Dec. 3	Nov. 26	Nov. 19
GASOLINE			
U. S. Motor	9.125– 9.25	9.25 – 9.50	9.375– 9.50
60-62 400 e.p.	10.50	10.50 –10.625	10.50
61-63, 390 e.p.	10.75 –11.00	11.00 –11.125	11.00
64-66, 375 e.p.	11.00 –11.25	11.25 –11.50	11.375–11.50
U. S. Motor, cases (cargoes)	$1.85	$1.90	$1.90
64-66, cases (cargoes)	$2.00	$2.05	$2.05
KEROSENE			
44 water white	7.75	7.75	7.75
41-43 prime white	6.50 – 6.75	6.625– 6.75	6.75
Water white, cases (cargoes)	$1.65	$1.65	$1.65
Prime white, cases (cargoes)	$1.55	$1.55	$1.55
DOMESTIC GAS & BUNKER OILS			
*26-30 translucent gas oil	3.75 – 3.875	3.875	3.875
*30-32 translucent gas oil	3.875	3.875– 4.00	3.875– 4.00
Grade C bunker oil	$0.85 –$0.95	$0.85 –$0.95	$0.85 –$0.95
Grade C bunker oil, cargoes	$0.65 –$0.68	$0.65 –$0.68	$0.65

*Less than ½ of 1% sulfur.

MEXICAN CRUDE AND BUNKER OILS (F. O. B. Steamer, Tampico)			
Heavy Panuco crude taxes to be paid	$0.90 –$0.95	$0.90 –$0.95	$0.90 –$0.95
Grade C bunker oil, for bunkering purposes, taxes paid	$1.05	$1.05	$1.05
SOUTH TEXAS LUBRICATING OILS (Viscosity at 100°F.: cold test 0) (Tanker, f.o.b. Houston)			
100 vis. No. 2 unfiltered pale	6.25 – 6.375	6.25 – 6.375	6.25 – 6.375
200 vis. No. 3 unfiltered pale	8.50 – 9.50	8.50 – 9.50	8.50 – 9.50
300 vis. No. 3 unfiltered pale	9.25 –10.50	9.25 –10.50	9.25 –10.50
500 vis. No. 3½ unfiltered pale	10.75 –12.00	10.75 –12.00	10.75 –12.00
750 vis. No. 4 unfiltered pale	12.50 –13.00	12.50 –13.00	12.50 –13.00
1200 vis. No. 5 unfiltered pale	15.50 –17.00	15.50 –17.00	15.50 –17.00
200 vis. No. 5-6 red oil	7.00 – 8.50	7.00 – 8.50	7.00 – 8.50
300 vis. No. 5-6 red oil	8.00 – 9.25	8.00 – 9.25	8.00 – 9.25
500 vis. No. 5-6 red oil	9.75 –10.50	9.75 –10.50	9.75 –10.50
750 vis. No. 5-6 red oil	11.25 –12.00	11.25 –12.00	11.25 –12.00
1200 vis. No. 5-6 red oil	14.50 –16.50	14.50 –16.50	14.50 –16.50

Pacific Export Market

(Quotations are at seaboard, Los Angeles, in cargo lots, cents per gallon, except where otherwise noted.)

	Dec. 3	Nov. 26	Nov. 19
Gasoline, U. S. Motor, 53-55 Gravity	8.00 – 8.25	8.00 – 8.25	8.00 – 8.50
Gasoline, U. S. Motor, blends and special cuts	8.50 –10.25	8.50 –10.25	9.00 –10.75
Gas Oil, 30-34, per barrel	$1.05 –$1.15	$1.05 –$1.25	$1.05 –$1.20
Diesel Oil, 27 plus, per barrel	$0.95 –$1.10	$0.95 –$1.10	$0.95 –$1.10
Bunker oil, 14-18, per barrel	$0.70 –$1.00	$0.70 –$1.00	$0.70 –$1.00
Fuel oil, 14-18 per barrel	$0.70 –$1.00	$0.70 –$1.00	$0.70 –$1.00
Kerosene, 38-40 w.w., 125-150 flash, per gal.	5.25 – 6.00	5.25 – 6.00	5.25 – 6.00
Cased Goods			
Gasoline, U. S. Motor	$1.75 –$1.85	$1.75 –$1.85	$1.75 –$1.85
Kerosene, 38-40 w.w., 125-150 flash	$1.45 –$1.50	$1.50 –$1.60	$1.50 –$1.60

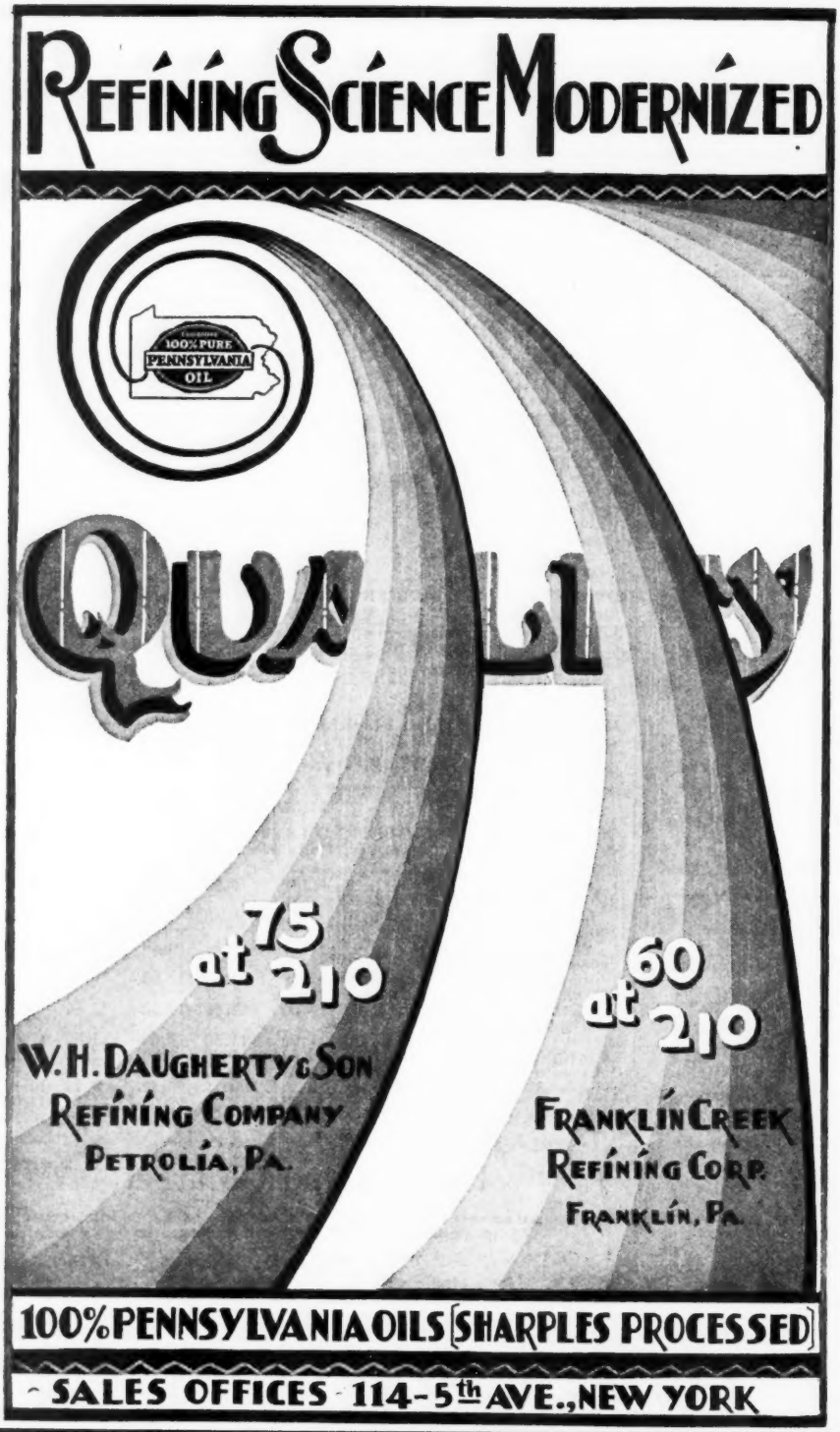
Tanker Rates

(Approximate tanker freight rates to Continental ports, in shillings per ton of 2240 pounds, British sterling; to American ports, cents per barrels)

	Dec. 3	
	Crude &/or Fuel	Refined Oil
Calif. to U. K. or Continental ports*	25	22–23
Gulf to U. K. or Continental ports*	13	12–13
North Atlantic to U. K. or Continental ports*	11/6	11
Calif. to North Atlantic ports (not E. of N. Y.)	50-55c	64–65c
Gulf and North Atlantic ports (not E. of N. Y.)**	16	20–25c

*Continental ports in the range between Bordeaux and Hamburg, both inclusive.

**For Venezuela loading 1c per bbl. additional. For Tampico loading 4c per bbl. additional.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QUALITY
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60 at 210
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CANADA

Tank Wagon, Service Station Markets for Gasoline and Kerosene

Prices in Effect December 3, 1928

(Per Imperial Gallon, which is 1.2 American Gallons)

	Gasoline T.W.	Tax	Total T.W.	S.S.	Oil T.W.
ONTARIO					
Toronto	20.5	3	23.5	27	22
Ottawa	20.5	3	23.5	27	22
Cochrane	25.5	3	28.5	..	27
Ft. William	23.5	3	26.5	30	23.5
MANITOBA					
Winnipeg	22.5	3	25.5	29	22.5
SASKATCHEWAN					
Regina	27	3	30	34	27
ALBERTA					
Edmonton	27.5	3	30.5	34	27.5
Calgary	23.5	3	26.5	30	23.5
BRITISH COLUMBIA					
Vancouver	22	3	25	29	23
QUEBEC					
Montreal	21.5	5	26.5	30	22
Quebec City	22.5	5	27.5	31	23
Three Rivers	22.5	5	27.5	31	23
NEW BRUNSWICK					
St. John	25	3	28	31.5	25
Moncton	25	3	28	31.5	25
NOVA SCOTIA					
Halifax	25	5	30	33.5	25
Sydney	25	5	30	33.5	25
PRINCE EDWARD ISLAND					
Charlottetown	25	5	30	33.5	25

Note: In districts surrounding these points 1¢ additional is added to city price.

Rodgers and Rieber Elected Texas Corp. Directors

NEW YORK, Nov. 30.—W. S. S. Rodgers, vice-president in charge of domestic sales and Capt. T. Rieber, vice-president in charge of export sales of The Texas Corp. were elected directors of the corporation at a meeting of the Board on Nov. 27.

Mr. Rodgers and Captain Rieber replace the vacancies on the Board brought about by the resignations of W. W. Bruce and D. J. Moran, both of whom recently became affiliated with the Marland Oil Co. It was as recent as Oct. 1 of this year that Mr. Rodgers was made vice-president in charge of domestic sales.

F. T. Manley, for several years manager of the corporation's refining activities, was elected vice-president in charge of refining at the meeting Nov. 27.

LOS ANGELES, Dec. 1.—Richfield Oil Co. has purchased from Eureka Refining Co., two bulk stations, and gasoline trucks, and is now serving the stations which had contracts with Eureka. The tentative arrangements for the Eureka Refining Co. to be taken over by the Italo Petroleum Corp. did not materialize.

Tank Wagon, Service Station Markets for Gasoline and Kerosene

(OIL PRICE HANDBOOK has t.w. and s.s. markets for the whole year, arranged for quick reference)

These Prices in Effect Dec. 3, 1928, as Posted by Principal Marketing Companies

S.O. NEW JERSEY TERRITORY

	Gasoline		Total		Oil
	T.W.	Tax	T.W.	S.S.	T.W.
Atlantic City, N. J.	15	2	17	20	14
Newark, N. J.	15	2	17	20	14
Annapolis, Md.	15	4	19	22	14
Baltimore, Md.	15	4	19	22	12
Cumberland, Md.	15	4	19	22	14
Washington, D. C.	15	2	17	20	14
Danville, Va.	15	5	20	23	14
Norfolk, Va.	15	5	20	23	14
Richmond, Va.	15	5	20	23	14
Roanoke, Va.	15	5	20	23	14
Petersburg, Va.	15	5	20	23	14
Charleston, W. Va.	15	4	19	22	14
Keyser, W. Va.	15	4	19	22	14
Parkersburg, W. Va.	15	4	19	22	14
Wheeling, W. Va.	15	4	19	22	14
Charlotte, N. C.	15	4	19	22	14
Hickory, N. C.	15	4	19	22	14
Mt. Airy, N. C.	15	4	19	22	14
Salisbury, N. C.	15	4	19	22	14
Charleston, S. C.	15	5	20	23	14
Columbia S. C.	15	5	20	23	14

*Dealers set own prices. S. O. New Jersey does not operate station.

S. O. NEW YORK

Due to local price conditions at many points in S. O. New York territory, actual prices on both gasoline and kerosene are being made at under the posted tank wagon prices published below.

New York City	18	0	18	*20	15
Albany, N. Y.	18	0	18	21	15
Buffalo, N. Y.	18	0	18	20	15
Rochester, N. Y.	18	0	18	20	13
Syracuse, N. Y.	18	0	18	20	15
Boston, Mass.	17	0	17	18	15
Augusta, Me.	17	4	21	22	15
Manchester, N. H.	17	4	21	22	15
Burlington, Vt.	17	3	20	21	15

*The Standard of New York does not operate stations in New York City. This figure is the retail price of a principal station operator in New York, selling Socony gasoline.

ATLANTIC REFINING

Pittsburgh, Pa.	†16	*	†16	*20	15
Philadelphia, Pa.	†16	*	†16	*20	15
Allentown, Pa.	†16	*	†16	*20	15
Erie, Pa.	†16	*	†16	*20	15
Scranton, Pa.	†16	*	†16	*20	15
Altoona, Pa.	†16	*	†16	*20	15
Dover, Del.	†16	3	†19	20	15
Wilmington, Del.	†16	3	†19	20	15
Boston, Mass.	17	0	17	18	15
Springfield, Mass.	17	0	17	18	15
Worcester, Mass.	17	0	17	18	15
Providence, R. I.	17	2	19	20	15
Hartford, Conn.	17	2	19	20	14
New Haven, Conn.	17	2	19	20	15

*3-cent state tax is collected by retail dealer and paid by him directly to state.

†Prices in the tank wagon columns in Pa. and Dela. are given by the Atlantic Ref. Co., Phila., as its official posted tank wagon market. It is understood that that company's prices to dealers, of certain classes at least, are 2c under the above figures.

S. O. KENTUCKY

Ashland, Ky.	17	5	22	24	15.5
Catlettsburg, Ky.	17	5	22	24	15.5
Lexington, Ky.	16	5	21	22	15.5
Louisville, Ky.	16	5	21	23	15
Covington, Ky.	17	5	22	22	15.5
Clarksdale, Miss.	17	4	21	23	13
Gulfport, Miss.††	18.5	4	22.5	24.5	14
Jackson, Miss.	15	4	19	21	14.5
Natchez, Miss.	16.5	4	20.5	22.5	14
Vicksburg, Miss.	16.5	4	20.5	22.5	14
Birmingham, Ala.	18	4	22	24	16
Mobile, Ala‡	18	4	22	24	15
Montgomery, Ala.*	17	4	21	22	16.5
Atlanta, Ga.	18	4	22	24	†16.5
Augusta, Ga.	18	4	22	24	†15.5
Macon, Ga.	18	4	22	24	†16.5
Savannah, Ga.	17	4	21	21	†15.5
Jacksonville, Fla.	18	5	23	25	14.5
Miami, Fla.	19	5	24	26	15.5
Tampa, Fla.	18	5	23	25	14.5
Pensacola, Fla.**	19	5	24	26	14.5

*Local privilege tax of 1 cent on gasoline and ½ cent on kerosene at Montgomery included. ‡Mobile gasoline prices include 1c city tax.

†Georgia kerosene prices include 1c state tax.

**Both tank wagon prices include 1c city tax at Pensacola, which went into effect Oct. 15, 1926.

††Both tank wagon prices at Gulfport include Harrison county privilege tax of 2c.

Latest Changes In Tank Wagon Prices

Gasoline Changes

Atlantic Refining—S.s. prices only cut 1c, Pennsylvania and Delaware, **Dec. 3.** New price is 20c generally, including 3c state taxes.

S. O. Indiana—S.s. price only cut 2c, Indianapolis, to 18.2c, including 3c tax, **Nov. 27.** T.w. unchanged at 18.2c.

S. O. Louisiana—T.w. price only cut 1c, Little Rock, to 18c, including 5c tax, **Nov. 27.**

S. O. Ohio—T.w. prices in Ohio have been changed in the tank wagon table to show the price to dealers, with a footnote showing price to consumers receiving tankwagon deliveries. This is no change in price, but merely a change on the part of this publication from showing of the consumers' price which we have published in the table since Nov. 21, to that of the dealers' price.

S. O. INDIANA

	Gasoline		Total		Oil
	T.W.	Tax	T.W.	S.S.	T.W.
Chicago, Ill.	15	0	15	17	12
Decatur, Ill.	15.2	0	15.2	15	12.1
E. St. Louis, Ill.	14.4	0	14.4	16.4	11.2
Joliet, Ill.	15.4	0	15.4	17.4	12.3
Peoria, Ill.	15.2	0	15.2	14	12.1
Quincy, Ill.	15.2	0	15.2	17.2	11.9
Indianapolis, Ind.	15.2	3	18.2	18.2	13.2
Evansville, Ind.	15	3	18	20	13
South Bend, Ind.	15.4	3	18.4	20.4	13.4
Detroit, Mich.	15.8	3	18.8	20.8	13.7
Grand Rapids, Mich.	15.7	3	18.7	20.7	13.6
Saginaw, Mich.	15.9	3	18.9	20.9	13.8
Green Bay, Wis.	15.6	2	17.6	19.6	12.4
Madison, Wis.	15.3	2	17.3	17.3	12.1
Milwaukee, Wis.	15.1	2	17.1	19.1	11.9
La Cross, Wis.	16.2	2	18.2	20.2	13
Minneapolis, Minn.	16.2	2	18.2	20.2	12.9
Duluth, Minn.	16.5	2	18.5	20.5	12.9
Mankato, Minn.	16.1	2	18.1	20.1	12.7
Des Moines, Ia.	15.5	3	18.5	18.5	12.3
Davenport, Ia.	15.5	3	18.5	20.5	12.3
Sioux City, Ia.	15.1	3	18.1	20.1	11.9
Mason City, Ia.	15.5	3	18.5	20.5	12.3
St. Louis, Mo.	*14.9	2	16.9	16.9	11.3
Kansas City, Mo.	†15.9	2	17.9	17.9	10.6
St. Joseph, Mo.	†15.5	2	17.5	17.5	11.2
Fargo, N. D.	17.9	2	19.9	21.9	14.9
Grand Forks, N. D.	18.2	2	20.2	22.2	15.2
Minot, N. D.	17.9	2	19.9	21.9	14.9
Pierre, S. D.	16	4	20	22	13.4
Huron, S. D.	16.3	4	20.3	22.3	13.7
Wichita, Kans.	13.8	2	15.8	17.8	10.8
Bartlesville, Okla.	13.5	3	16.5	18.5	10.5

S. O. Indiana's quantity contract price schedule on tank truck deliveries of gasoline, figured from the service station price, is 2c for 500 gals. or more a month; 2½c for 2000 gals. or more a month; and 3c for 6000 gals. or more a month.

*Includes city tax of ½c

†Includes city tax of 1c.

CONTINENTAL OIL

Denver, Colo.	16	3	19	22	14.5
Pueblo, Colo.	16	3	19	22	14.5
Grand Junc., Colo.	19.5	3	22.5	25.5	18
Casper, Wyo.	16	3	19	22	13
Cheyenne, Wyo.	17	3	20	23	14.5
Butte, Mont.	20.5	3	23.5	26.5	19
Helena, Mont.	20.5	3	23.5	26.5	19
Salt Lake City, Utah	18.5	3½	22	25	17
Boise, Ida.	20.5	4	24.5	27.5	19
Twin Falls, Ida.	20.5	4	24.5	27.5	19
Albuquerque, N. M.	17	5	22	25	17

S. O. CALIFORNIA

Phoenix, Ariz.	12	4	16	20	21.5
Los Angeles, Cal.	13.5	3	16.5	20.5	15.5
Fresno, Cal.	14	3	17	21	16.5
San Francisco, Cal.	14	3	17	21	15.5
Reno, Nev.	18	4	22	26	19
Portland, Ore.	14.5	3	17.5	21.5	16.5
Seattle, Wash.	14.5	2	16.5	20.5	16.5
Spokane, Wash.	18.5	2	20.5	24.5	20.5
Tacoma, Wash.	14.5	2	16.5	20.5	16.5

S. O. LOUISIANA

Little Rock, Ark.	13	5	18	22	14
Alexandria, La.	13	2	15	18	†16
Baton Rouge, La.	12	2	14	17	†14.5
Lake Charles, La.	13.5	2	15.5	18.5	†16
New Orleans, La.	*11.5	2	*13.5	*16.5	†16
Shreveport, La.	13.5	2	15.5	18.5	†15
Lafayette, La.	13	2	15	18	†15.5
Bristol, Tenn.	16	3	19	22	15
Chattanooga, Tenn.	15 5	3	18 5	21.5	16
Knoxville, Tenn.	14	3	17	20	16
Nashville, Tenn.	13	3	16	19	16
Memphis, Tenn.	14	3	17	20	15

*New Orleans gasoline prices include 1c parish tax in addition to 2c state tax, and kerosene prices include 1c state tax and 1c parish tax.

†Kerosene price in Louisiana includes 1c state tax

S. O. OHIO

	Gasoline		Total		Oil
	T.W.	Tax	T.W.	S.S.	T.W
All Ohio points	14	3	*17	20	12

*1⅔c to consumers who receive tank wagon deliveries, including 3c tax.

S. O. NEBRASKA

Omaha, Neb.	15.25	2	17.25	19.25	12.25
McCook	16.75	2	18.75	20.75	13.75
Norfolk	15.75	2	17.75	19.75	12.75
North Platte	16.75	2	18.75	20.50	13.50
Scottsbluff	16.75	2	18.75	20.75	13.25

MAGNOLIA PETROLEUM

Muskogee, Okla.	15	3	18	20	12
Oklahoma City	15	3	18	20	12
Tulsa, Okla.	14	3	17	19	10
Fort Smith, Ark*	15	†3	18	20	14
Little Rock, Ark.	16	5	21	23	14
Texarkana, Ark.*	14 5	*2	16 5	20 5	13
Dallas, Tex.	14	2	16	20	12
Fort Worth, Tex.	14	2	16	19	12
Houston, Tex.	14	2	16	20	15
San Antonio, Tex.	12	2	14	17	11
El Paso, Tex.	15	2	17	20	16

*Within city of Texarkana, the state tax on gasoline is 2c per gal. conforming with the Texas state tax. In this district outside of the city the 5c Arkansas tax applies.

†Within city of Fort Smith, Oklahoma tax of 3c applies. In this district outside of the city, the 5c Arkansas tax applies.

V. M. & P. NAPHTHA

(Changes ordinarily occur coincident with gasoline price changes)

	Oleum Spirits	V.M.&P. Naphtha	Cleaner Naphtha
Chicago	14.7	16.2	18
Detroit	16.4	17.9	19.7
Kansas City	†14.9	†16.4	†18.2
Milwaukee	15.4	*18.9	*20.7
Minneapolis	*18.7	*20.2	*22
St. Louis	14.6	16.1	17.9
New York		20	....

*Includes 2c state tax. †Includes 1c city tax.

Above prices include these inspection fees on both gasoline and kerosene, per gallon: Alabama, 1/40c on gasoline, 1/2c kerosene; Arkansas, 1/20c on both; Colorado, 1/10c on both; Florida, 1/8c on both; Indiana, 2/25c on both; Kansas, 1/50c on both; Louisiana, 1/32c on gasoline, 1c on kerosene; Minnesota, 3/50c on both; Missouri, 1/50c on both; Nebraska, 3/50 to 1/2c on both; North Carolina, 1/4c on both; North Dakota, 1/20c on both; Oklahoma, 4/25c on both; South Carolina, 1/8c on both; South Dakota, 1/10c on both; Tennessee, 2/5c on gasoline and 1/2c on kerosene; Wisconsin, 3/50c on both.

Kerosene inspection fees only: Iowa, 13/100c; Michigan, 1/5 to 4/5c per gal.

In Illinois, cities and villages have the power to appoint oil inspectors and fix inspection fees which is done in some instances. In some cases in the above states or other states there are local inspection fees.

Crude Oil Prices (in Effect Dec. 3)

(Crude prices for the whole year in OIL PRICE HANDBOOK published annually)

EASTERN FIELDS

(Posted by Joseph Seep Purchasing Agency)

Penna. Grade Oil in New York Transit Lines (Alleghany, N. Y. District)	$3.60
Bradford District Oil in National Transit Lines (Bradford District)	3.60
Penna. Grade Oil in National Transit Lines (Other Pennsylvania)	3.50
Penna. Grade Oil in Southwest Penna. Pipe Lines (Other Pennsylvania)	3.50
Penna. Grade Oil in Eureka Pipe Lines (West Virginia)	3.40
Penna. Grade Oil in Buckeye Pipe Lines (Macksburg, O. district)	3.25
Cabell Grade in Eureka Pipe Lines (West Virginia)	1.45
Corning Grade in Buckeye Pipe Lines (Ohio)	1.80
Corning, O., heavy grade	1.70
Somerset Oil in Cumberland Pipe Lines (Kentucky)	1.75
Ragland Grade in Cumberland Pipe Lines (Kentucky)	.95

(Posted by Stoll Oil Refining Co.)

Oil City, Ky., oil in Stoll lines	$1.75

CENTRAL STATES FIELDS

Posted by Ohio Oil Co.

Effective July 27, 1928

Wooster (Oct. 17)*	$1.77	Princeton	$1.55
Lima	1.60	Illinois	1.55
Waterloo	1.20	Plymouth	1.28
Indiana	1.37	West Kentucky	1.63

*Wooster crude run prior to Oct. 17, 1928 takes price of $1.67.

CANADIAN CRUDE

Posted by Imperial Oil Refineries, Ltd.

Petrolia	$2.00
Oil Springs	2.07

OKLAHOMA, KANSAS and NORTH TEXAS

Prices of Prairie Oil & Gas Co.

(In Oklahoma, Kansas, North and East Central Texas)

Effective July 26, 1928

Below 25	$0.60	35-35.9	$1.31
25-25.9	0.67	36-36.9	1.36
26-26.9	0.74	37-37.9	1.41
27-27.9	0.81	38-38.9	1.46
28-28.9	0.88	39-39.9	1.51
29-29.9	0.95	40-40.9	1.56
30-30.9	1.02	41-41.9	1.61
31-31.9	1.09	42-42.9	1.66
32-32.9	1.16	43-43.9	1.71
33-33.9	1.21	44 and above	1.76
34-34.9	1.26		

Humble Oil & Refining Co. Prices

(Ranger, North Texas, Mexia, Powell, Richland, Wortham, Lytton Springs, Currie, Moran and Nocona crudes all in Texas.)

July 26, same schedule as Prairie.

Mirando, Tex	$1.00

Magnolia Petroleum Co.

(In Oklahoma, Kansas and North and East Central Texas)

July 26, Magnolia posted in above fields and in Panola Co., same schedule as Prairie, except these grades:

Below 25	$0.60	27-29.9	$0.75
25-25.9	0.67	30-30.9	0.90
26-26.9	0.74	31-31.9	1.05

Glasscock, Crane, Upton, Winkler Counties	0.65
Chalkfield (Howard Co.)	0.80
Iatan district	0.93
Corsicana heavy	1.00

Carter Oil Co.

(Oklahoma and Kansas)

July 26, same schedule as Prairie except Carter does not post oil below 25.

PANHANDLE, TEXAS

Humble Oil & Refining Co.

Effective July 26, 1928

Hutchinson and Carson Counties:

Below 32	$0.69	38-38.9	$1.06
32-32.9	0.76	39-39.9	1.11
33-33.9	0.81	40-40.9	1.16
34-34.9	0.86	41-41.9	1.21
35-35.9	0.91	42-42.9	1.26
36-36.9	0.96	43-43.9	1.31
37-37.9	1.01	44 and above	1.36

Wheeler County:

Below 30	$0.65	37-37.9	$1.11
30-30.9	0.72	38-38.9	1.16
31-31.9	0.79	39-39.9	1.21
32-32.9	0.86	40-40.9	1.26
33-33.9	0.91	41-41.9	1.31
34-34.9	0.96	42-42.9	1.36
35-35.9	1.01	43-43.9	1.41
36-36.9	1.06	44 and above	1.46

Gray County:

Below 29	$0.68	37-37.9	$1.21
29-29.9	0.75	38-38.9	1.26
30-30.9	0.82	39-39.9	1.31
31-31.9	0.89	40-40.9	1.36
32-32.9	0.96	41-41.9	1.41
33-33.9	1.01	42-42.9	1.46
34-34.9	1.06	43-43.9	1.51
35-35.9	1.11	44 and above	1.56
36-36.9	1.16		

WEST TEXAS

Humble Oil & Refining Co.

Effective July 26, 1928

Winkler, Crane, Upton, Crockett, and Pecos Counties	$0.65

NORTH LOUISIANA—ARKANSAS FIELDS

Prices of Standard Oil Co. of Louisiana

Caddo, Homer, Haynesville, Bull Bayou, El Dorado, Crichton, De Soto and **Cotton Valley.

Effective July 26, 1928

Below 28	$0.81	36-36.9	$1.36
28-28.9	0.88	37-37.9	1.41
29-29.9	0.95	38-38.9	1.46
30-30.9	1.02	39-39.9	1.51
31-31.9	1.09	40-40.9	1.56
32-32.9	1.16	41-41.9	1.61
33-33.9	1.21	42-42.9	1.66
34-34.9	1.26	43-43.9	1.71
35-35.9	1.31	44 and above	1.76

**Cotton Valley, below 36, $0.75. Beginning with 36-36.9, same schedule as above.

Smackover, below 24	$0.75
do 24 and above	.90
Bellevue	1.25
*Urania, La	.90
†East El Dorado	0.75

*Posted by Louisiana Oil Refining Corp.

†Posted by Magnolia Petroleum Co.

Smackover prices posted on Feb. 7 by S. O. La., Gulf, Shreveport-El Dorado Pipe Line, Atlantic Oil Producing Co. and The Texas Co.; on Feb. 8 by Magnolia; on Feb. 6 by La. Oil Refg. Corp.

Aug. 8 The Texas Co., same schedule in Louisiana as Standard, plus these grades: 24-24.9, $0.60; 25-25.9, $0.67; 26-26.9, $0.74; 27-27.9, $0.81.

Aug. 7 Magnolia Petroleum met Standard schedule in Louisiana-Arkansas fields.

STEPHENS, ARKANSAS

Louisiana Oil Refining Corp., and Atlantic Oil Producing Co.

Effective Aug. 2, 1928

Below 28	$0.75	30-30.9	$0.87
28-28.9	0.79	31-31.9	0.91
29-29.9	0.84	32 and above	0.95

GULF COASTAL

Posted by Humble Oil & Refining Co.

Effective March 14, 1927

Grades A	$1.20	29-29.9	$1.25
Grades B:		30-30.9	1.27
Below 25	1.15	31-31.9	1.29
25-25.9	1.17	32-32.9	1.31
26-26.9	1.19	33-33.9	1.33
27-27.9	1.21	34-34.9	1.35
28-28.9	1.23	35 and above	1.37

Fields classified as A and B are Spindletop, Goose Creek, Hull, Liberty, Sour Lake, West Columbia, Orange, Boling, Pierce Junction, Sugarland and Raccoon Bend. All other fields are Grades A only

Marland Reorganizes Offices

TULSA, Dec. 1.—Tulsa wholesale sales offices of the Marland Refining Co. here were closed today as a part of the reorganization of the Marland sales department. A. H. Blackall, who has been in charge, is being transferred to Memphis, where he will be a territory representative.

The marketing department reorganization will include the consolidation of the retail and wholesale departments and a concentration of business in the Chicago, Kansas City, New York and Ponca City offices. A wholesale sales office will be retained at Minneapolis.

PONCA CITY—John R. McGinley, vice-president of the Marland Production Co., has resigned effective Dec. 1. Mr. McGinley will move back to Tulsa, from whence he was transferred several months ago, and engage in leasing and royalty business.

Engineering Staff Enlarged

TULSA, Nov. 30.—The engineering department of the White Eagle Oil & Refining Co. has been enlarged by the addition of E. J. Bray and A. E. Gustavson to the staff at Augusta, Kans. E. C. Marshall, general superintendent of refineries, was a visitor at the Augusta plant last week.

Writes University Pageant

TULSA, Nov. 30.—Miss Dorothy Durkee, daughter of C. C. Durkee, superintendent of the White Eagle Oil & Refining Co. plant at Augusta, is the author of a pageant which was given by students of the University of Kansas on Nov. 28 at Lawrence.

Exports From Tampico District

Company	September	October
Transcontinental-Rayon Cos. (Standard of New Jersey)	466,320	647,911
Huasteca Petroleum Co. (Pan American)	768,861	669,267
Mexican Eagle Oil Co. Ltd. (El Aguila)	491,415	411,699
Cia. Mexicana Holandesa "La Corona"	229,885	125,183
The Texas Co. of Mexico, S. A.	54,505	132,211
Sinclair Mexican Companies	61,659	346,682
Pierce Oil Corp.	52,295	4,785
Mexican Atlas Oil Co.	51,341	50,856
Panuco Boston Oil Co.	.....	48,961
Empire Gas & Fuel Co.	84,026	120,978
Mexican Gulf Oil Co.	65,751	.....
New England Fuel Oil Co.	64,773	.....
Totals	2,390,831	2,558,533

IMPERIAL

56-58 U. S. Motor

A Winter Grade With Anti-Knock Value

I. P.	Under	100° F
25%	At	221° F
50%	At	284° F
90%	At	392° F
E. P.	Under	437° F
Dr. Test		Negative
Color		Water White
Odor		Good
BENZOL EQUIVALENT		
by Motor Test		*25%-30%*

A low gravity gasoline meeting full Specifications will give you greater mileage. This is a product meeting seasonal requirements with perfect performance.

Our Regular Products

56/58 U. S. Motor Gasoline
58/60 U. S. Motor Gasoline
60/62 400 E. P. Gasoline
68/70 Aviation Gasoline
High Compression Gasoline
42/44 Kerosene
Zero Furnace Oils
28/32 Gas Oil (Straw)
32/36 Gas Oil (Straw)
Tractor Fuel
Diesel Fuel
16/20 Fuel Oil
Road Oils
Transmission Oils

"We Meet Equivalent Competition"

IMPERIAL REFINING COMPANY

General Offices
TULSA, OKLAHOMA

Crude Oil Prices (in Effect Dec. 3)

(Crude prices for the whole year in OIL PRICE HANDBOOK published annually)

GULF COASTAL

Prices of The Texas Co.

Effective March 14, 1927

Grades A	$1.20	*Grades B	$1.15
‡Grades B (light crude):			
35-35.9	$1.37	38-38.9	$1.43
36-36.9	1.39	39-39.9	1.45
37-37.9	1.41	40 and above	1.47

*Grades B include all heavy crudes which do not meet tests for Grades A or for Gulf Coast light crude.

‡The Texas Co.'s gravity and price schedule on all below 35° is same as Humble's postings on Grades B.

ROCKY MOUNTAIN FIELDS

Prices of Ohio Oil Co., and Midwest Refining Co.

(Salt Creek prices effective July 26, 1928)

‡Salt Creek	29-29.9	$0.95
" "	30-30.9	1.02
" "	31-31.9	1.09
" "	32-32.9	1.16
" "	33-33.9	1.21
" "	34-34.9	1.26
" "	35-35.9	1.31
" "	36-36.9	1.36
" "	37 and above	1.41
Elk Basin		1.48
Grass Creek light		1.48
Big Muddy		1.33
Lance Creek		1.48
Rock Creek		1.33
Mule Creek		1.10
Rex Lake		1.10
‡Osage		1.48
‡Cat Creek, Mont.		1.48
Sunburst, Mont		1.65
‡Hogback, N. Mex		1.48
Artesia, N. Mex.		1.08

‡Posted by Midwest Refining Co. Midwest also buys Grass Creek light and Elk Basin.

CALIFORNIA

***Standard Oil Co. of California**

Gravity	Signal Hill Seal Beach Alamitos Heights Huntington Beach	Inglewood Torrance	Olinda-Brea Canon Richfield	Athens-Rosecrans Dominguez	Whittier La Habra	Coyote Hills	Santa Fe Springs	Newhall McKittrick	†Kern River	Midway Sunset Buena Vista & Elk Hills	Lost Hills	Coalinga	Wheeler Ridge	Montebello	Santa Maria	Ventura
14-14.9	$ .85	$ .85	$ .85	....	$ .85	$ .85	....	$ .75	$ .50	$ .75	$ .75	$ .75	$ .75	$ .85	$ .85	$ .85
15-15.9	.85	.85	.85	....	.85	.85	....	.75	.50	.75	.75	.75	.75	.85	.85	.85
16-16.9	.85	.85	.85	....	.85	.85	....	.75	50	.75	.75	.75	.75	.85	.85	.85
17-17.9	.85	.85	.85	....	.85	.85	....	.75	50	.75	75	.75	.75	.85	.85	.85
18-18.9	.85	.85	.85	....	.85	.85	....	.75	50	.75	.75	.75	.75	.85	.85	.85
19-19.9	.85	.85	.85	....	.85	.85	....	.75	.50	.75	.75	.75	.75	.85	.85	.85
20-20.9	.85	.85	.85	....	.85	.85	....	....	....	.77	.77	.77	.77	.86	.85	.85
21-21.9	.89	.89	.89	....	.88	.88	.89	....	....	.79	.79	.79	.79	.89	.86	.86
22-22.9	.93	.93	.93	....	.91	.91	.92	....	....	.82	.82	.82	.82	.92	.87	.80
23-23.9	.97	.97	.97	....	....	.94	.95	....	....	.86	.86	.85	.85	.95	.90	.97
24-24.9	1.01	1.01	1.01	1.01	....	.97	.98	....	....	.90	.90	.88	.88	.98	.93	.94
25-25.9	1.05	1.05	1.05	1.05	....	1.00	1.01	....	....	.95	.95	91	.91	1.01	.95	.98
26-26.9	1.09	1.09	1.09	1.09	....	1.04	1.04	....	....	1.00	1.00	.94	.94	1.04	.97	1.02
27-27.9	1.13	1.13	1.13	1.13	....	1.08	1.07	....	....	1.05	1.05	.98	.97	1.07	....	1.06
28-28.9	1.17	1.17	1.17	1.17	....	1.12	1.10	....	....	1.10	1.10	1.02	....	1.10	....	1.10
29-29.9	1.21	....	1.21	1.21	....	1.16	1.15	....	....	1.16	1.16	1.06	....	1.13	....	1.14
30-30.9	1.25	....	1.25	1.25	....	1.20	1.20	....	....	1.22	1.22	1.10	....	1.16	....	1.18
31-31.9	1.30	....	....	1.30	....	....	1.25	....	....	1.28	1.28	1.14	....	....	....	1.23
32-32.9	1.35	....	....	1.35	....	....	1.30	....	....	1.34	1.34	1.18	....	....	....	1.28
33-33.9	....	....	....	1.41	....	....	1.35	....	....	1.40	1.40	1.22	....	....	....	....
34-34.9	....	....	....	1.47	....	....	1.40	....	....	....	1.46	1.26	....	....	....	....
35-35.9	....	....	....	1.53	....	....	1.45	....	....	....	....	1.30	....	....	....	....
36-36.9	....	....	....	1.59	....	....	1.50	....	....	....	....	....	....	....	....	....
37-37.9	....	....	....	1.65	....	....	1.55	....	....	....	....	....	....	....	....	....
38-38.9	....	....	....	1.71	....	....	1.60	....	....	....	....	....	....	....	....	....
39-39.9	....	....	....	1.77	....	....	1.65	....	....	....	....	....	....	....	....	....
40-40.9	....	....	....	1.83	....	....	....	....	....	....	....	....	....	....	....	....
41-41.9	....	....	....	1.89	....	....	....	....	....	....	....	....	....	....	....	....
42-42.9	....	....	....	1.95	....	....	....	....	....	....	....	....	....	....	....	....

*Santa Maria and Ventura postings are by Union Oil Co. Union Oil Co. posts same prices in all above fields as Standard except in Montebello and Wheeler Ridge. It also posts Elwood Terrace at same price as Rosecrans—Dominguez and also posts Santa Maria (Orcutt) and Ventura.

†Kern River down to 12° gravity is 50c; 11-11.9 is 45c.

REFINERS' and COMPOUNDERS' SUPPLIES

Following are average market prices for materials used by refiners and compounders effective on the date shown.

Refiners' Supplies

	Dec. 3	Nov. 26
Soda Ash light 58% bags, cwt.	$1.32	$1.32
Silicate of Soda 60 deg. drums, cwt.	$1.55	$1.55
Silicate of Soda 40 deg. tank cars, cwt.	$0.60	$0.60
Silicate of Soda 40 deg. drums, cwt.	$0.80	$0.80
Sal Soda wks.	$0.90-1.00	$0.90-1.00
Caustic Soda 76% solid, cwt.	$2.90	$2.90
Sulfuric Acid 60 deg. tank cars, f.o.b. shipping point per ton	$11.00	$11.00
Oleum 20%, fuming sulfuric, tank cars, wks.	$18.50	$18.50
Sulfur, flowers of, cwt.	$3.10-4.00	$3.10-4.00
Liquid Chlorine, tank cars, wks., lb.	3.00-4.50	3.00-4.50
Litharge, powered, casks, cwt.	9.00	9.00

Compounders' Supplies

	Dec. 3	Nov. 26
Vegetable Oils		
Linseed carloads, spot, lb.	10.20	10.40
Tanks, spot	9.40	9.60
Soya Bean, Tanks, coast, lb.	9.75	9.625
Oleic Acid		
Distilled, tanks, lb	8.75	8.75
Distilled, bbls., lb.	9.50	9.50
Saponified, tanks, lb.	9.00	9.00
Saponified, bbls., lb.	9.75	9.75
Lard Oils		
Prime Winter Strained, lb.	16.00	16.00
Extra Winter Strained, lb.	14.00	14.00
Extra, lb.	13.25	13.25
Extra No. 1, lb.	13.00	12.875
No. 1, lb.	13.00	12.50
No. 2, lb.	12.25	12.25
Tallow oil, lb.	12.25	12.25
Neatsfoot Oil		
Pure, bbls., lb.	15.25	15.25
Extra, bbls., lb.	13.25	13.125
No. 1 bbls., lb.	12.75	12.75
Cold Pressed, lb.	19.00	19.00
Fish Oils		
Menhaden Oil		
Light Pressed, gal.	66-68	66-68
Light Pressed, tank cars, N. Y., gal.	59-60	59-60
White bleached, gal.	73-74	73-74
Yellow bleached, gal.	70-72	70-72
Whale, extra winter bleached, gal.	84	84
Naval Stores		
Steam distilled turpentine, N. Y., gal.	59	57
Steam distilled turpentine, Savannah, gal.	54	52
Gum turpentine, N. Y., gal.	62	61.50
Gum turpentine, f.o.b. cars Savannah, gal.	58	58
Wood Rosin F, N. Y., bbl.	$8.20	$8.20
Wood Rosin F, Savn'h., bbl.	$7.40	$7.40
Gum Rosin B, N. Y., bbl.	$9.15	$9.10
Gum Rosin B, f.o.b. cars Savannah, bbl.	$8.40	$8.35
Rosin oil pure, gal.	62	62
Rosin oil, compounded, gal.	51	51
Pine Tar		
Kiln burnt, bbl.	$13.00-14.00	$13.00-14.00
Retort, bbl.	$13.50-14.50	$13.50-14.50
Alcohol		
Denatured, Formula 5, in bbls., per gal.	55-62	55-62

*Nominal.

HIGHLAND
for CABS

This Model RB-54 Highland Cab is typical of all Highland cabs—soundly constructed, convenient, and comfortable.

Notice the large, clear opening at the side, permitting the driver to see where he is going in backing up, and to facilitate signalling. The roof is of 1/8 inch steel and insulated.

And, of course, it has the exclusive Highland Rocker Sill Mounting, which permits the chassis frame to roll and twist without transmitting this movement to the cab.

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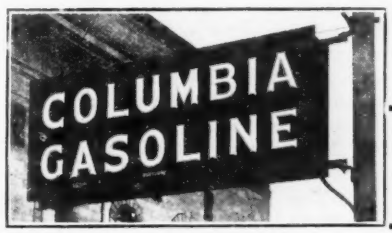

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OIL STOCKS AND FINANCES

National Petroleum News

Prairie Pipe Line to Split Shares And Pay 25% Stock

Staff Special
CLEVELAND, Dec. 1

THE Prairie Pipe Line Co. will pay a stock dividend of 25 per cent Jan. 8 if stockholders at a meeting Jan. 4 approve a proposal to change the par value of the stock from $100 to $25 a share and increase the number of shares from 810,000 to 4,050,000. Approval is expected.

The proposal was adopted by directors at their meeting in Independence, Kans., Nov. 26. Stockholders of Dec. 6 record will be entitled to vote at the Jan. 4 special meeting.

Application will be made to list the new stock on the New York Stock Exchange, W. F. Gates, president, announced in his letter to stockholders.

Prairie Pipe Line continues to be linked in a possible merger fostered by the interests headed by Arthur W. Cutten, the Chicago market operators, and Fisher brothers, the Detroit automobile body manufacturers.

It is reported that John D. Rockefeller, Jr., has sold about 14 per cent of the stock in the pipe line company to Blair & Co., New York investment house, which stock will be used in engineering a merger. This stock was not the personal holding of the younger Rockefeller but came from three trust estates created several years ago by his father, it is reported.

The list of stockholders of the pipe line company as of June 30, 1928, shows John D., Jr., to have held 254,280 of the outstanding 810,000 shares at that time, a little more than 30 per cent. The General Education Board held 166,800 shares, or approximately 20 per cent. The Laura Spellman Rockefeller Memorial held 48,000 shares. The Northern Finance Corp., a Rockefeller interest, owned 87,840 shares.

The University of Chicago owned 10,980 shares, Mrs. Edith Rockefeller McCormick 2448 shares, and Acta Rockefeller Prentice 2460 shares.

Gulf Coastal Water Shipments, September Compared with August

(All Figures in Barrels of 42 Gallons)

Company — Port	Coastwise Refined August	Coastwise Refined September	Export Refined August	Export Refined September
Standard of Louisiana, Baton Rouge	739,300.00	620,091.00	1,099,330.00	383,975.00
The Texas Company, Port Arthur	1,466,804.00	1,610,945.00	303,211.00	341,393.00
Gulf Refining Co., Port Arthur	2,292,546.25	2,590,390.85	120,140.83	80,165.87
Magnolia Petroleum Co., Beaumont	785,971.80	1,414,952.78(a)	.....	.....
Humble Oil & Refg. Co., Baytown	1,070,604.76	1,256,562.60	1,315,803.15	1,916,748.23
Atlantic O. Producing Co., Atreco	181,147.97	69,715.66	.....	.....
Deepwater Oil Refineries, Houston	.....	.....	.....	.....
Pure Oil Company, Smiths Bluff	585,738.97	453,531.47	3,971.76	133,919.52
Crown Central Pet. Corp., Houston	.....	.....	.....	.....
Totals	7,122,113.75	8,016,189.36	2,842,456.74	2,856,201.62
	Coastwise Crude		**Export Crude**	
Standard of Louisiana, Baton Rouge	846,924.00	423,864.00	52,915.00	53,463.00
The Texas Company, Port Arthur	71,842.00	51,744.00	.....	.....
Gulf Refining Co., Port Arthur	235,466.64	109,339.16	.....	.....
Magnolia Petroleum Co., Beaumont	765,563.72	470,080.16(a)	.....	.....
Humble Oil & Refining Co.				
Texas City	743,183.00	980,890.00	40,549.00	.....
Ingleside	1,556,805.00	65,555.00	139,323.00	.....
Baytown	465,485.00	413,386.00	.....	.....
Neches	.....	73,484.00	.....	.....
Harbor Island	.....	1,942,995.00	.....	.....
Atlantic Oil Producing Co.				
Atreco	637,512.86	780,838.64	.....	.....
Beaumont	326,852.56	372,216.30	.....	.....
Smiths Bluff	34,541.19	.....	.....	.....
Pure Oil Company, Smiths Bluff	566,568.84	505,353.05	.....	.....
Sun Oil Company, Sabine Pass	849,361.00	438,233.00	.....	.....
Crown Central Petroleum Corp., Houston	.....	.....	.....	.....
Totals	7,100,105.81	6,627,978.31	232,787.00	53,463.00

(a)—Magnolia Petroleum Company makes no distinction in reports between coastwise and export shipments.

Independent Improves Current Position

NEW YORK, Dec. 1.—Independent Oil & Gas Co. in the 10 months ended Oct. 31 earned $3,226,229 after all charges, reserves and federal taxes. With good earnings and the sale of stock to stockholders of Nov. 30 record at a rate of 3 2/3 shares for each 10 shares held, the company's current position is greatly improved.

June 30 Independent had current assets of $6,922,166 and current liabilities of $3,485,051. After giving effect to the new financing and retirement of $4,000,000 bonds and preferred stock of the Manhattan Oil Co. of Kansas City, and $2,200,000 bank loans, the balance sheet as of Oct. 31 showed current assets of approximately $11,700,000 and current liabilities of $1,400,000, a ratio of about 8 to 1.

June 30 the company had outstanding $5,908,000 12-year 6 per cent debentures which are convertible until next March 15 into common stock at $32.94 a share. The stock recently has been selling above 35.

Large Block of United Gas Sold

CLEVELAND, Dec. 1.—Sale of 200,000 shares of United Gas Co. stock at $15 a share has been advertised by G. E. Barrett & Co., New York investment banker. This stock does not involve a new issue. It was acquired from present stockholders for sale to an unrevealed purchaser. The United Gas Co. is a holding and managing company which controls the Houston Gulf Gas Co., Dixie Gulf Gas Co., Dixie Gas & Utilities Co., and South Texas Gas Co. which operate in the Louisiana and Texas gas fields and supply among others such cities as Houston, San Antonio, Austin, Beaumont and Port Arthur with natural gas.

Texon Alters Capital Structure

NEW YORK, Dec. 1.—Texon Oil & Land Co. stockholders Nov. 28 approved an increase in the capital stock of this company from 10,000,000 $1 shares to 2,000,000 no par shares. New certificates will be issued on a basis of one no par share for each five $1 shares outstanding. Application is to be made to list the new stock on the New York Curb market.

Financial Notes

Phillips Petroleum Co.—Earnings this year will exceed regular dividends and the extra dividend of 50 cents a share which has been declared payable Jan. 2 to stock of Dec. 14 record, Frank Phillips, president, said in New York. The company has approximately $30,000,000 in current assets after purchasing $4,500,000 of its bonds and setting up a sinking fund for retirement of $1,000,000 more bonds Dec. 1.

Crystal Oil Refining Co.—Net profit in October, after all charges, was $41,038 and for the 10 months ended Oct. 31, $264,118. Company has 102,987 shares outstanding.

Skelly Oil Co.—Net profit in October was $704,118 after all charges, compared with $689,654 in September. Net for 10 months ended Oct. 31 was $3,166,525 on 1,093,684 shares of stock.

Plymouth Oil Co.—Net earnings in eight months ended Aug. 31 after all charges including federal taxes and payment of dividends to minority holders in the Big Lake Oil Co., were $1,943,739. This sum is equivalent to $1.37 on each of the 1,500,000 outstanding $5 capital shares.

Sinclair Consolidated Oil Corp.—Reduction of funded debt is expected since a large block of treasury stock was sold to Arthur W. Cutten, the Chicago stock market operator, and his associates.

American Maracaibo Corp. Increases Capital

NEW YORK, Dec. 1.—Authorized capital stock of the American Maracaibo Corp. has been increased from 2,000,000 to 4,000,000 no par shares. The number of directors was authorized increased from 12 to 15 and the office of chairman was created.

The company has completed purchase of the producing properties of the Henshaw Oil Corp. in Texas. Henshaw properties mostly in west Texas comprise 32,000 acres.

F. H. Wickett, former chairman of the Pan-American Petroleum & Transport Co., is not associated with American Maracaibo.

Pacific Western Elects Directors

NEW YORK, Dec. 1.—Directors of the Pacific Western Oil Co. and its holding company, the Pacific Western Oil Corp., recently organized to acquire the California producing properties of Edward L. Doheny and family, are as follows: Jacques Vinmont, Los Angeles, chairman; Earle Bailie, James R. Simpson and Lloyd Gilmour, New York; Charles R. Blyth, San Francisco, and William C. McDuffie, Edward Nolan, George L. Eastman and David P. Babcock, Los Angeles.

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Transactions in Oil Shares on New York Stock Exchange

1927 High	1927 Low	1928 High	1928 Low	Listed Capital	Par Value	Stocks	Div. Rate	Last Paid	Transactions Week Ended Dec. 1 Sales	First	High	Low	Last	Change
37⅞	27⅜	43⅜	27⅜	(sh) 922,075	N.P.	Amerada Corp.	50cQ	Oct. 31, 28	22,700	45	43⅜	39½	39½	— 3⅝
82½	35⅛	85	51¼	(sh) 209,180	N.P.	American Republics Corp.	....	....	6,600	72	73¾	70⅝	71⅛	— 1
50¼	35	53⅝	37½	$56,000,000	$ 25	Associated Oil	50cQ	Sept. 29, 28	410	47⅛	47¾	46¾	47¾	— ¼
....	....	63¼	54¼	50,000,000	25	Atlantic Refining (New stock)	a$1Q	Sept. 15, 28	81,500	54	55	50	54¾	+ ¾
119	115½	118¼	113½	20,000,000	100	do pfd	$1.75Q	Nov. 1, 28	410	116	116½	116	116	— 1⅝
35½	20¾	53	20⅛	30,971,225	25	Barnsdall Corp. A	50cQ	Oct. 31, 28	46,900	47⅞	48⅛	45¼	45⅝	— 1½
32½	20½	51⅛	22	581,850	25	do B	50cQ	Oct. 31, 28	....	....	....	....	....	....
18¼	14	23½	12¼	946,518	N.P.	Beacon Oil	....	....	16,300	21⅞	22	21¼	21½	— 2
32⅞	20	35	24	51,524,150	25	California Petroleum	25cQ	Oct. 1, 28	....	....	....	....	....	....
96⅝	65	94⅞	70	20,980,400	100	General Asphalt	....	....	41,400	82	84½	80⅛	81⅞	+ ⅝
144⅞	107¼	141½	111	6,662,200	100	do pfd	$1.25Q	Dec. 1, 28	3,200	122½	126	122	124	+ 2⅛
175¾	60⅛	167	127	25,000,000	100	Houston Oil	....	....	1,100	134	134	131	131	— 1½
32¾	17⅝	37½	21¾	(sh) 659,000	N.P.	Independent Oil & Gas	37½cQ	Oct. 31, 28	2,300	36⅛	17⅞	15⅝	18¼	0
12⅛	7⅝	39⅝	9	$3,582,670	$ 10	Indian Refining	....	Dec. 15, 20	50,900	37⅞	38⅝	34½	34½	— 3⅛
12	7¼	33⅛	8⅛	4,550,110	10	do ctfs	....	....	32,300	35	35	30⅛	31⅛	— 2
112	99	250	101	2,296,400	100	do pfd	....	Dec. 15, 21	200	185	185	185	185	+ 4⅜
37¾	20⅛	39⅛	27⅜	(sh) 3,992,234	N.P.	Lago Oil & Transport	75cQ	Nov. 1, 28	2,200	35⅜	35⅜	34½	34⅞	— ½
18⅛	10	19¾	9⅜	(sh) 1,187,003	N.P.	Louisiana Oil Refining	....	....	22,500	17½	18¼	17⅜	17¼	0
97	85¼	101	78	$4,000,000	$100	do pfd	$1¾Q	Nov. 15, 28	270	91	91½	91	91	+ 1½
22¾	12	25½	12½	(sh) 330,000	N.P.	Maracaibo Oil	....	....	1,400	19	20	18⅞	19⅝	+ ⅜
58½	31	49⅜	33	(sh) 2,316,851	N.P.	Marland Oil Co.	....	Mar. 31, 27	85,600	49	49	46⅜	46½	— 1½
320	200	360	250	$45,942,800	$100	Mexican Petroleum	$3Q	Oct. 20, 28	....	....	....	....	....	....
....	....	....	....	12,000,000	100	do pfd	$2Q	Oct. 20, 28	....	....	....	....	....	....
9¼	3	7²³⁄₄	4⅝	(sh) 995,500	N.P.	Mexican Seaboard	....	Nov. 15, 24	192,500	67⅜	*72¾	63⅛	68⅝	+ 2⅛
39⅜	25½	44½	25⅛	(sh) 1,857,461	N.P.	Mid-Continent	....	Aug. 1, 27	79,900	44¼	44½	40¼	42	— 2
105	97	115⅛	103¼	$6,718,000	$100	do pfd	$1.75Q	Dec. 1, 28	....	....	....	....	....	....
3¾	1⅝	7⅜	2⅜	24,060,470	10	Middle States	....	July 1, 23	84,200	6	7	5⅞	7	+ 1
2¾	1¼	5⅞	1½	5,739,750	10	do ctfs	....	....	3,200	4½	5	4	5	+ 1
1⅞	1	2¼	1	(sh) 3,500,000	N.P.	Pacific Oil	....	....	168,200	1¼	1⅞	1⅛	1⅝	+ ½
65⅞	40¼	55⅛	38¼	$50,000,000	$ 50	Pan American P. & T.	....	Oct. 20, 27	5,500	54¼	54¼	52	53¾	+ ½
66⅜	40¼	58⅞	37¾	121,100,000	50	do B	....	Oct. 20, 27	47,100	57⅜	57⅜	55	55¾	— 1⅛
37⅞	16¾	59	15½	(sh) 400,000	N.P.	Pan American Western B	....	Jan. 30, 27	500	18½	18½	18	18	0
18⅞	8	21⅜	11⅛	(sh) 199,370	N.P.	Panhandle P. & R.	....	....	3,100	15½	15⅞	14½	15	— ½
83	54	106¼	70	$2,935,200	$100	do pfd	....	July 2, 23	....	....	....	....	....	....
60¼	36¼	53⅞	35¼	(sh) 2,406,796	N.P.	Phillips Petroleum	37½cQ	Oct. 1, 28	65,600	53	53¼	50½	50⅞	— 1⅝
1⅜	½	4¼	½	$29,622,925	$ 25	Pierce Oil	....	....	15,400	3⅛	3¼	3	3⅛	+ ⅛
24	13½	50	16¼	15,000,000	100	do pfd	....	Feb. 1, 22	900	36	37	36	37	+ 1
5⅛	2½	6⅜	3½	(sh) 2,500,000	N P.	Pierce Petroleum	....	....	14,600	6	6⅛	5⅞	6	0
33⅞	16⅜	29⅞	16	$37,450,850	$ 50	Producers & Refiners	....	Sept. 15, 23	10,500	27	28⅝	27	27¼	+ ¼
50	36⅞	47⅜	41	2,845,350	50	do pfd	....	May 1, 25	250	47½	47½	46½	47½	+ ¼
33½	25	31⅝	19	75,952,250	25	Pure Oil Co.	25cQ	Dec. 1, 28	55,300	30½	30⅞	28¾	29⅛	— ⅞
115½	111⅜	115	108	13,000,000	100	do 8% pfd	$2Q	Oct. 1, 28	120	113¼	113½	113	113	— ½
28⅝	25⅜	56	24	$43,764,450	$ 25	Richfield Oil	50cQ	Nov. 15, 28	41,000	51⅞	52½	50	51	— 2
54½	44¼	64	44⅝	(sh) 585,293	13.40	Royal Dutch N. Y. shares	$1.879	Aug. 3, 28	2,900	62½	62¾	60⅝	61¾	— 1
47⅞	41⅝	57½	40⅝	(sh) 67,300	£2	Shell Transport & T.	$1.455	July 23, 28	....	....	....	....	....	....
31⅜	24⅝	39⅝	23¼	(sh) 10,000,000	N.P.	Shell Union Oil	35cQ	Sept. 30, 28	79,100	37½	38⅛	36¼	37	— 1
26⅜	14¼	27¼	18⅛	$7,208,080	$ 10	Simms Petroleum	....	Apr. 1, 27	21,000	26¼	26¼	24⅝	24¾	— ⅞
22⅜	15	46¾	17⅛	(sh) 4,503,031	N.P.	Sinclair Consolidated	....	May 31, 24	58,100	45½	46	43¼	44⅞	— ¼
104½	97	110	102½	$16,310,100	$100	do pfd	$2Q	Nov. 15, 28	500	109	109	108½	108½	— ½
37⅜	24⅛	42⅝	25	27,396,590	25	Skelly Oil Co.	50cQ	Sept. 15, 28	26,000	42⅜	42½	39	39⅞	— ⅞
60¾	50⅝	78½	53	(sh) 13,016,434	N.P.	S. O. California	62½cQ	Sept. 15, 28	98,200	79⅞	80	75¼	75¼	— 3¼
41⅜	35½	59⅜	37¾	$610,195,375	$ 25	S. O. New Jersey	‡25cQ	Sept. 15, 28	236,900	54	*59⅜	53⅝	57⅝	+ 4¼
34½	29¾	41¾	28¾	431,973,275	25	S. O New York	40cQ	Sept. 15, 28	373,200	39⅞	*41¾	39⅝	41⅝	+ 2½
34⅞	30	77	31½	(sh) 1,300,532	N.P.	Sun Oil	25cQ	Sept. 15, 28	5,600	70⅝	*77	70⅝	75	+ 5½
101⅜	99	109½	100	$5,000,000	$100	do pfd	$1.50Q	Dec. 1, 28	50	106	106	106	106	0
6½	3⅛	14½	2½	(sh) 1,186,078	N.P.	Superior Oil Corp	....	Dec. 20, 20	235,400	13⅞	*14¼	12⅛	12½	— 1¼
58	45	74¾	50	$210,577,050	$ 25	The Texas Corp.	75cQ	Oct. 1, 28	83,000	68¾	69½	68½	68⅞	+ ⅜
18⅞	12	26⅝	12½	8,380,340	10	Texas Pacific Coal & Oil	....	Jan. 3, 28	39,000	24¼	24⅞	22½	22½	— ⅜
29¼	19	36	19⅝	(sh) 2,168,498	N.P.	Tide Water Oil Co.	20cQ	Sept. 29, 28	59,200	34⅛	41½	34⅛	40⅜	+ 6⅜
90½	85	100	87	$20,705,200	$100	do 5½% pfd	$1.25Q	Nov. 15, 28	2,100	95¼	*100	95	100	+ 5¼
19⅜	15¾	24⅜	14⅜	(sh) 4,824,766	N P.	Tide Water Associated	....	Aug. 1, 27	28,400	23½	24	22¾	23¾	+ ⅝
90¾	85	91½	82⅛	$72,745,958	$100	do pfd	$1.50Q	Oct. 1, 28	2,100	90	*91½	90	91½	+ 1½
10⅛	3⅜	14½	7	(sh) 3,842,029	N.P.	Transcontinental Oil	....	....	119,700	13⅜	13½	12⅛	12⅜	— ⅞
56½	39⅝	58	42¾	$40,841,100	$ 25	Union Oil of California	50cQ	Nov. 10, 28	18,200	57⅜	57½	54½	55⅞	+ ⅜
127½	94	128⅛	110	31,061,200	100	Union Tank Car Co.	$1.25Q	Dec 1, 28	200	118	125	118	123	+ 5
34½	24½	44⅞	26	(sh) 357,197	N.P.	Warner Quinlan	50cQ	Oct. 1, 28	14,100	42⅜	42⅞	41⅝	42	0
27½	20	38	20⅛	(sh) 490,000	N P	White Eagle Oil & Refining	50cQ	Oct. 20, 28	65,400	35½	*38	35½	37	+ 2¼
....	....	22½	18⅜	(sh) 418,967	N.P.	Wilcox Oil & Gas	....	May 10, 28	900	21	21⅛	20¾	20¾	— ½

Total Sales 2,775,310

*New High †New Low ††Ex-dividends ‡Also extras s-Stock a-On old $100 stock

Pittsburgh Stock Exchange

1927 High	1927 Low	1928 High	1928 Low	Par Value	Stocks	Transactions Week Ended Nov. 30 Sales	First	High	Low	Last	Change
....	....	4	2½	N.P.	Ark. Nat. Gas (new)	13,245	3½	3⅝	3⅜	3⅜	— ⅛
....	....	7¾	6¾	N.P.	do pfd	5,109	7⅝	*7¾	7½	7½	— ¼
98¾	80⅞	130	90¼	100	Colombia Gas	....	....	....	....	....	....
107⅞	100	124	107	100	do pfd	....	....	....	....	....	....
15	7⅛	10	6⅞	10	Devonian Oil	165	9	9	8½	8¾	— ¼
....	....	15	9	10	Dixie Gas & Util.	....	....	....	....	....	....
....	....	95	75	100	do pfd	....	....	....	....	....	....
117⅛	115	116	115	100	Duquesne Light pfd	....	....	....	....	....	....
....	....	85	80⅛	100	Fayette County Gas	....	....	....	....	....	....
12¼	6	22	12	N.P.	Houston Gulf Gas	....	....	....	....	....	....
59¾	37¼	66	48⅜	$ 25	Lone Star Gas	1,218	64⅝	65⅝	64¼	65½	+ 1
....	....	38	35	25	Petroleum Exploration	100	35	35	35	35	— ½
....	....	50	50	....	Phoenix Oil pfd	....	....	....	....	....	....
3¼	3	4⅞	3	5	Pittsburgh Oil & Gas	....	....	....	....	....	....
8	5⅓	7¼	5¾	10	Salt Creek Cons.	....	....	....	....	....	....
26½	17	22	16½	10	Tidal Osage	....	....	....	....	....	....
43	33	40	30½	N.P.	Waverly Oil Wks A	100	38	39	38	39	+ 1
....	....	19	16	$ 25	Wiser Oil	....	....	....	....	....	....

*New high record †New low.

Pittsburgh Curb Exchange

1927 High	1927 Low	1928 High	1928 Low	Par Value	Stocks	Transactions Week Ended Nov. 30 Sales	First	High	Low	Last	Change
....	....	....	....	....	Ark. Gas (old)	....	....	....	....	....	....
95	88	140½	120	25	Gulf Oil	....	....	....	....	....	....
....	....	115	115	..	Houston Gulf Gas pfd	....	....	....	....	....	....
10¾	5½	9	4¾	25	Leonard Oil & Dev	....	....	....	....	....	....
....	....	9⅞	9⅞	....	Pennkas Oil & Gas	....	....	....	....	....	....
2¼	1¼	....	....	5	Pittsburgh Oil Dev	....	....	....	....	....	....
31	19	30¼	16¾	5	Plymouth Oil	2,650	29⅞	29⅞	28¾	28¾	0
6	5	4¾	4	5	States Oil	....	....	....	....	....	....
3⅛	1⅛	4½	2¼	1	Texon Oil & Land	....	....	....	....	....	....
23¾	18	18	15	10	Tidal Osage Non-vgt	....	....	....	....	....	....

*New High †New Low x Ex Dividend

Cleveland Stock Market

Nov. 30	Par Value	Bid	Asked
Canfield Oil Co	100	171	180
do pfd	100	103	....
Fred G. Clark	10	8½	9
National Refining	25	27	38
do pfd	100	137	....
Paragon Refining Co	25	18½	20
do pfd	N.P.	43	45
do ctf. of deposit	..	17½	19

x Ex dividend.

THE OIL INDUSTRY EXCHANGE

Positions Wanted

EXPERIENCED REFINERY SALES REPRESENTATIVE desires new connection with refinery which wishes to increase sale of its products. Thoroughly dependable and anticipate connection only with reliable organization, either in foreign or domestic capacity. Address Box 236.

REFINERY COST ACCOUNTANT now open for position, thoroughly familiar with pipe line and production accounting. Address Box 219.

REFINERY SUPERINTENDENT with years of experience in both operation and construction wishes to make connection with some progressive company. References and history of experience gladly furnished. Address Box 223.

AVAILABLE

An experienced oil man, as a sales executive or to take complete charge; has a definite record of success in back of him; is possessed with practical manufacturing knowledge together with being a top notcher on sales; is capable of making dealer contact, coaching salesmen, helping to develop sales policies, etc., etc.

At present employed as manager in the New York District and can so remain, have excellent reasons for desiring a change. Young enough to be modern with twelve years experience to season him.

Desires to connect with an organization that will measure remuneration commensurate with ability with the privilege of acquiring an interest, if and when he desires.

Address Box 238

Situations Open

SALESMEN WANTED. One of our clients needs salesmen in midwest territory including Western Penna., Ohio, Indiana, Illinois, Missouri, Iowa, Kansas and a few in Southern and Western States. Men who are now traveling preferred. Those who are selling oil and gasoline could add this line. No samples to carry. Send full particulars covering experience and territory now covered. Anchor Advertising Agency, Third National Building, Dayton, Ohio

CHEMIST WANTED

with plant or laboratory experience in lubricating oil manufacture. Submit complete details of experience and personal history in reply.

Address Box 220

MEN—INTERESTED SOUTH AMERICAN WORK with large oil, mining companies who pay fare and expenses write for our warranted service offer. South American Service Bureau, 14,600 Alma, Detroit, Mich.

GREASE SALESMAN WANTED

Prefer one with experience selling advertised brand of grease in the south. In replying give age, educational advantages, experience and salary expected; and state when you can start work.

Address Box 241, National Petroleum News

Business Opportunities

FATTY CONCENTRATES

"Petrosolve:" A paste dissolved in pale or red viscous neutrals produces clear translucent opal or ruby cup, gun or gear grease.

"Koldbase:" A paste cold mixture for making gun or gear grease.

"Kastorbase" (contains no castor oil) for motor or caster machine oils.

Free samples with instructions to oil jobbers.

Ask about our 5 and seventy-five gallon laboratory and experimental gas or steam heated compounding kettles.

F. E. Martin & Co., Lake Bluff, Ill.

PETROLEUM PRODUCTS BOUGHT ON COMMISSION

Make this office your Tulsa buying office on a commission basis.

Let's Exchange References

DALE W. MOORE

582-583 Mayo Bldg., Tulsa, Okla
Telephones: 3-4177 and 3-4178
L. D. 136

Miscellaneous

EXPERT TESTING SERVICES

Gasoline—Lubricating Oil—
Furnace and Fuel Oil

Complete Analysis
Moderate Prices

Rackliffe Petroleum Testing Laboratories
New Britain, Conn.

12 YEARS experience in oil accounting, exclusively. We install systems and make audits. Specialists in analyzing losses common to the oil jobber.

Address Box 237

Wanted to Buy

EQUIPMENT WANTED: Wish to buy 20-car steel loading rack. Give location, price and physical condition. Address Box 239.

ROTARY PUMPS WANTED

Exporter purchasing $10,000 worth rotary pumps desires full particulars and literature from manufacturers only. Prices must be competitive.

Address Box 240
care National Petroleum News

Advertisers having box numbers should be addressed in care of National Petroleum News, 1213 W. 3rd St., Cleveland, Ohio, unless otherwise specified.

For Sale

INVESTIGATE

150 car new garage and super-gas station. Access to R. R. siding for tank car purchase. Located in heart of City of 50,000. Aurora has a $3,500,000 building program for 1929. The owner is in manufacturing business and cannot devote his time.

Address P. O. Box 133, Aurora, Ill.

TRIBAL OSAGE OIL LEASES AT PUBLIC AUCTION, DECEMBER 11, 1928, BY UNITED STATES GOVERNMENT. December 11, 1928, at Pawhuska, Oklahoma, about 30,000 acres will be offered for oil leases in quarter section tracts. Bids will be for bonus in addition to royalties. 25% payable on day of sale, balance in three annual instalments, with acceptable security. Within advertised area there are about 9,870 wells producing from one barrel to 400 barrels each, the total daily production for August, 1928, being about 50,300 barrels; also, there are about 50 wells drilling. All lands are now leased separately for gas. Blue print maps of area advertised, showing tracts producing oil or gas, can be had for fifty cents each, also logs of producing oil or gas wells for twenty-five cents each well. Write U. S. Superintendent, Osage Agency, Pawhuska, Oklahoma, for maps, logs or other information.

WHITE—5-TON TANK TRUCK—1927 MODEL

with fifteen hundred gallon, 5-compartment Davis Welding Company tank, with can racks, in wonderful shape—tires good. Price—$2,000.

Address—Mack-International Motor Truck Corp., 1064 Broadway, Albany, N. Y.

Call for Bids to Purchase Government Royalty Oil from Salt Creek field, Wyoming. The Secretary of the Interior invites sealed bids to be submitted at his office, Interior Department Building, Washington, D. C., on or before noon of December 10, 1928, for the royalty oil accruing to the United States from leases on Government land within the Salt Creek oil field in the State of Wyoming, for a period of three (3) years beginning January 1, 1929. For the calendar year 1927 the total Government royalty oil from the Salt Creek field amounted to approximately 1,920,000 barrels, and for the period from January 1 to August 31, 1928, to approximately 1,280,000 barrels, the average gravity in both years being in the range from 36.0 to 36.9 degrees A. P. I.

Bids must be based upon the highest posted field price for oil of like gravity in Oklahoma and Kansas, and or in Wyoming, whichever is the higher, and must be stated as a differential in cents per barrel from such posted price. Delivery of royalty oil will be made on each leasehold for the account of the successful bidder. Payments for the royalty oil are to be made to the Register of the United States Land Office at Cheyenne, Wyoming, on or before the fifteenth (15th) day of each month following that in which delivery is made and shall be computed on the basis of tank measurement with (2) per cent strapping in terms of standard barrels at sixty (60) degrees Fahrenheit.

The successful bidder will be required to furnish a corporate surety bond in the sum of $250,000 conditioned upon full and complete compliance with the terms of the contract.

The Secretary of the Interior may accept any bid which in his judgment is most advantageous to the Government, and reserves the right to reject any or all bids.

Sealed bids are to be submitted to the Secretary, Department of the Interior, Washington, D. C., the envelope to be marked plainly, "Bid on Salt Creek royalty oil." No bid received after the time herein fixed for submitting bids will be considered.

Additional information can be obtained from the Geological Survey, Department of the Interior, Washington, D. C., or from the field offices of the Geological Survey at Casper, Wyoming. ROY O. WEST, Secretary of the Interior.

Standard Oil Stocks on New York Curb

1927 High	1927 Low	1928 High	1928 Low	Outstanding Capital	Par Value	Stocks	Div. Rate	Last Paid	Transactions Sales	Week First	Week High	Week Low	Ended Dec. 1 Last	Change
21⅝	17⅞	22⅜	17	L 4,126,460	L 1	Anglo-American Oil	24.4c	June 6, 28	3,700	18¼	18½	18⅛	18⅜	— ⅛
21½	17⅝	20½	16¾	.....	L 1	do cts. non-voting	.....	.....	2,200	18	18⅛	17½	17½	— ½
3¾	¾	5	1¼	(sh) 500,000	N.P.	Atlantic Lobos	.....	.....	1,700	2½	2¾	2¼	2¾	+ ¼
6½	2½	9¾	3¼	$ 10,000,000	$ 50	do pfd	.....	.....	.....	.....	.....	.....	.....	.....
69	50	56	44½	1,000,000	25	Borne Scrymser	‡$1S.A.	Oct. 15, 28	300	47	47	47	47	— 2
60	45	76	58	10,000,000	50	Buckeye Pipe Line	‡$1Q	Sept. 15, 28	400	68½	68½	66	67⅞	— ⅜
126	76½	161	117¼	3,000,000	25	Chesebrough Mfg	‡$1Q	Sept. 29, 28	100	150¼	154¾	150¼	154¾	+ 4¾
22⅝	16¼	23	16	36,123,350	10	Continental Oil	.....	Dec. 15, 27	37,000	19¾	20	19	19¾	0
137	89	114	79½	1,500,000	50	Cumberland Pipe Line	$15	Sept. 15, 28	300	74	74	74	74	— 5½
68½	47	88	64⅛	5,000,000	100	Eureka Pipe Line	$1Q	Nov. 1, 28	800	71½	71⅞	71½	71⅞	— ⅜
13½	3½	13	5	16,000,000	100	Galena Signal Oil	.....	June 30, 25	200	7½	7½	7½	7½	+ ¼
59¾	23	87¾	27	4,000,000	100	do new pfd	.....	June 30, 26	.....	.....	.....	.....	.....	.....
60⅛	35½	89¾	35	2,000,000	100	do old pfd	.....	June 30, 26	.....	.....	.....	.....	.....	.....
68½	54	114¾	60	73,685,700	25	Humble Oil & Refining	‡30cQ	Oct. 1, 28	29,100	109⅞	109⅞	102¼	107½	+ ½
182	123¾	290½	176½	20,000,000	100	Illinois Pipe Line	$6S.A.	June 15, 28	3,300	259	*290½	258	289	+34
64¾	37¾	104	56¾	(sh) 6,591,458	N.P.	Imperial of Canada	‡25cQ	Dec. 1, 28	3,100	91	95	91	92½	— 2¼
94½	61	91⅞	74⅞	$ 5,000,000	$ 50	Indiana Pipe Line	‡$1Q	Nov.15, 28	1,800	82⅞	85	82⅞	85	+ 2¼
39	28¼	55	35	(sh) 7,123,544	N.P.	International Petroleum	25c	June 30, 28	33,500	48¾	52	48¼	48⅞	— ⅜
24	13¾	32⅜	19⅜	6,363,350	12.50	National Transit Co	‡25cQ	Sept. 15, 28	2,700	23¾	24	23½	23¾	+ ¼
44½	31¾	75	37½	5,000,000	100	New York Transit	.....	July 15, 26	.....	.....	.....	.....	.....	.....
100	70	125	56½	2,000,000	50	Northern Pipe Line	(a)$3S.A.	July 2, 28	110	67	68	67	68	+ 4¾
67⅞	52	83½	58	60,000,000	25	Ohio Oil Co	50cQ	Sept. 15, 28	20,400	78	*83½	76	80⅛	+ 4⅜
39	12	84	28	10,000,000	25	Penn Mex. Fuel	$1.25	May 31, 28	200	37⅞	37⅞	37⅞	37⅞	— ⅛
55½	45⅜	68	46	60,479,000	25	Prairie Oil & Gas	.....	Aug. 31, 27	102,200	66¼	*68	62½	65⅜	+ 1¼
190	132	278	172	81,000,000	100	Prairie Pipe Line	$3.50Q	Oct. 31, 28	15,000	252	*278	250	263	+16
201½	175½	216	167	4,000,000	100	Solar Refining	$5S.A.	June 20, 28	300	215	215	210	215	+ 3
27¾	15½	35⅞	12	1,000,000	10	Southern Pipe Line	$2	Dec. 1, 27	.....	.....	.....	.....	.....	.....
41½	35	81½	36¾	20,000,000	25	South Penn Oil	‡50cQ	Sept. 29, 28	3,100	67½	67¾	64⅝	66⅛	— 1⅜
83	55½	100¾	70	3,500,000	100	South West Pa. Pipe Lines	$1Q	Oct. 1, 28	200	80	80	80	80	— ½
81½	64⅝	95⅞	70⅞	230,788,513	25	S. O. Indiana	‡62½cQ	Sept. 15, 28	38,200	92¼	93½	91¼	91⅞	+ 1⅜
20⅞	14⅝	27¾	15	8,000,000	25	S. O. Kansas	.....	June 16, 24	2,500	23½	23⅞	23⅛	23¼	+ ⅜
130	111½	179¾	122¼	17,103,011	25	S. O. Kentucky	$1Q	Sept. 29, 28	12,700	175	176⅞	169¾	174⅞	— 2
49½	40	54⅞	39⅞	4,601,100	25	S. O. Nebraska	63cQ	Sept. 20, 28	700	52¼	53⅜	51⅝	53⅜	+ 1⅛
87½	72	134	71	14,000,000	25	S. O. Ohio	62½cQ	Oct. 1, 28	15,550	104	*134	103	122	+18¾
122	117¼	125	116	7,000,000	100	do pfd	$1.75Q	Dec. 1, 28	10	119½	119½	119½	119½	+ 2
21	14½	26	16	861,466	25	Swan Finch Co	30c	June 30, 28	300	21¾	21¾	21½	21¾	— ¾
.....	.....	101¼	72	126,154,100	25	Vacuum Oil	75cQ	Sept. 20, 28	6,100	99¼	99¾	97	97½	— 1⅛

*New high †New low xEx dividend ‡Also extras. (a)$50 Special Sept. 1, 1928

Independent Oils on New York Curb

1927 High	1927 Low	1928 High	1928 Low	Par Value	Stocks	Transactions Sales	Week First	Week High	Week Low	Ended Dec. 1 Last	Ch'ge
2 1/16	.55	1½	.65	$ 5	Amer. Con. Oilfields	67,600	75	78	70	75	+ 3
7½	2¾	9½	3⅛	N.P.	Amer. Maracaibo	192,600	9	9¼	8⅛	8⅝	— ⅝
2⅜	1	4¼	2¼	$ 10	Argo Oil	7,300	4	4	3¾	4	+ ¼
9¾	6¾	10¼	3⅜	10	Arkansas Nat. Gas	2,600	3¾	3¾	3½	3⅝	+ ⅛
.....	.....	29⅜	3¾	...	Barnsdall deb. war	76,500	23¾	24	20	21⅜	— 2
40	20½	55	29⅞	N.P.	British American	.....	.....	.....	.....	.....	.....
28¼	15½	23⅞	3⅜	25c	Carib Syndicate N	20,400	4⅜	4⅝	†3⅞	4	0
.....	.....	.....	.....	.....	do ctfs. of dep	.....	.....	.....	.....	.....	.....
58¾	40¼	74½	54	$ 20	Cities Service	15,100	72¾	74⅛	72⅜	73	0
95⅜	87	103½	94½	100	do pfd	3,000	99	99⅜	99	99⅜	0
8⅞	7⅜	9⅜	8⅞	10	do pfd. B	600	9¼	9¼	9¼	9¼	0
29¼	22½	94	28¼	10	do banker's shares	.....	.....	.....	.....	.....	.....
3⅞	1⅜	2¼	1	1	Colombia Syndicate	4,200	1⅜	1½	1¼	1⅜	— 1/16
9¾	6⅜	15⅜	6⅜	10	Consolidated Royal	500	6½	6½	6½	6½	0
14⅞	9½	17½	10	N.P.	Creole Syndicate	23,900	12	12⅜	12	12¼	0
3	.50	3¼	.76	N.P.	Crown Central	8,200	1⅞	2⅛	1¾	2¾	+ 1
12	4	33¾	8⅛	N.P.	Darby Petroleum	3,600	27⅛	30½	27⅛	29⅛	+ 2⅛
11½	4	13½	7⅞	....	do trust ctfs	.....	.....	.....	.....	.....	.....
2½	.74	22	1	N.P.	Derby Oil & Refining	.....	.....	.....	.....	.....	.....
16¾	4	21⅜	7½	N.P.	do pfd	100	20	21	20	20	— 1⅜
3¾	1	2	1	N.P.	Gibson Oil	.....	.....	.....	.....	.....	.....
2	.40	.53	.15	N.P.	Gilliland ctfs	.....	.....	.....	.....	.....	.....
118	86¼	165	101⅜	$ 25	Gulf Oil Corp	29,100	159⅜	159⅞	150¼	154	— 3⅞
2½	.80	7⅞	1	10	Intercontinent Pet	649,900	2⅜	3⅜	2⅜	3⅛	+ ⅜
2¼	1⅛	3	1¼	N.P.	Kirby Petroleum	100	1¾	1¾	1¾	1¾	— ¼
10⅞	5⅛	9⅜	5⅛	N.P.	Leonard Oil & Dev	2,800	6	6	5¾	5¾	— ¼
27½	20	43⅜	20	N.P.	Lion Oil & Refg	3,900	39¾	39¾	37⅝	37⅝	— 1⅜
59⅜	37	65⅞	48⅜	$ 25	Lone Star Gas	800	64½	65	64½	65	+ ½
2⅞	.80	1⅞	.54	1	Magdalena Synd	8,500	73	73	65	65	— 1
21½	20⅞	22⅛	22⅛	N.P.	Manhattan Oil	.....	.....	.....	.....	.....	.....
52	12	45	34½	N.P.	Margay Oil	.....	.....	.....	.....	.....	.....
3	1⅜	40½	40½	$ 10	Mexican-Panuco	.....	.....	.....	.....	.....	.....
12⅛	5	8	2¾	N.P.	Mexico-Ohio Oil	600	3¾	4	3½	4	+ ⅛
1½	1	1⅛	.76	$ 1	Mountain & Gulf	17,300	1¼	1⅜	1⅛	1⅛	+ ⅛
29¼	22¾	28⅜	19½	10	Mountain Producers	4,100	22	22	21⅜	21⅜	— 4
5⅞	4⅜	5⅝	4¼	5	New Bradford	2,100	4⅞	5	4⅝	5	+ ⅛
6¼	4	5½	3	10	New England Fuel	100	3	3	3	3	— ⅛
16	9¼	11⅜	7⅛	1	New Mex. & Ariz	600	9¼	9¼	9	9	0
13⅞	9	15½	11½	25	New York Oil	.....	.....	.....	.....	.....	.....
.....	.....	40	39⅛	....	North Amer. Oil Cons	.....	.....	.....	.....	.....	.....
12¾	9½	13¼	10	N.P.	North Cent. Texas	100	10¼	10¼	10¼	10¼	0
23⅞	21¼	.....	.....	....	Okla. Nat. Gas ctfs	.....	.....	.....	.....	.....	.....
9⅜	3¼	6	2¼	N.P.	Pandem	2,500	3⅜	3⅜	3	3⅛	0
12⅛	7	15⅜	8½	N.P.	Panapec Oil	8,000	11¼	11½	11	11½	0
9	7⅝	20	10⅝	$ 25	Paragon Refg	.....	.....	.....	.....	.....	.....
.37	.25	9	4	N.P.	Peer Oil Corp	.....	.....	.....	.....	.....	.....
13½	5⅜	7¾	4⅞	10	Pennok Oil	1,500	6⅜	6¾	6⅛	6⅛	— ⅜
.....	.....	5⅜	3⅛	5	Pittsburgh Oil & Gas	.....	.....	.....	.....	.....	.....
24⅜	7	14½	8	25	Red Bank Oil	.....	.....	.....	.....	.....	.....
15½	3½	13	4⅛	N.P.	Reiter-Foster	5,000	9	9¼	8¼	8⅜	— ¾
28⅜	15	31⅛	18	$ 25	Richfield Oil pfd	100	24½	24½	24½	24½	+ ⅛
.....	.....	23	7½	....	do warrants	.....	.....	.....	.....	.....	.....
7	4½	12	4⅜	N.P.	Ryan Consolidated	16,800	10⅝	*12	9¾	10	— ¾
8	5¼	7¼	5⅜	$ 10	Salt Creek Cons	200	5¾	5¾	5¾	5¾	0
35½	27¼	35	23¼	10	Salt Creek Prod	12,600	25⅞	25⅞	25¼	25⅜	0
7	1¼	3½	1	5	Savoy Oil	.....	.....	.....	.....	.....	.....
.....	.....	4⅝	3	1	Texon Oil & Land	38,200	3⅛	3⅛	3⅝	3¾	+ 1/16
26½	17	22⅞	13	10	Tidal Osage	1,200	17	17	16	16⅛	— ⅝
23¾	15	21¼	13⅛	10	do non-voting	500	16	16	14⅝	16	0
92	63½	91⅞	75	100	Transcontinental pfd.	400	86	*88	85	88	+ 1½
23¼	7	66½	18	10	Venezuela-Mexico	600	64	*66½	64	66½	+ 4½
7⅜	4¼	9⅛	4¾	5	Venezuelan Petrol	72,200	7⅝	*9⅛	7½	8⅞	+ 1¼
8	4⅝	8¼	4⅞	$ 1	Woodley Petroleum	1,200	5⅛	6¼	5⅛	6	+ ⅜
6	1¾	8⅜	2⅜	25	Y Oil & Gas (new)	4,500	5⅞	6	5⅛	5½	— ½

*New High †New Low xEx Dividend

New York Curb Bonds

Week Ending Nov. 30

	High	Low	Last	Ch'ge
Beacon Oil 6s '36	113¾	113⅛	113⅛	— ⅞
Cities Serv. 5s '66	94¾	93½	94	— ⅞
Cities Serv. 6s '43	99¼	98½	99	0
Cities Serv. G 5½s '57	97½	96¾	97¼	— ¼
Cont. Oil 5½s '37	105	105	105	0
Empire O & R 5½s '42	93	92½	92¾	— ¼
Galena Oil 7s '30	100⅝	100⅜	100⅜	+ ⅛
Gulf Oil 5s '37	101¼	101	101	— ½
Gulf Oil 5s '47	102	101½	102	+ ⅜
Indep. Oil 6s '39	116¾	112¼	112⅞	+ ⅜
Richfield Oil 6s '41	132¼	130	130	— ¼
Richfield Oil 5½s '31	106	105	105	— ½
Sun Oil 5½s '39	102½	101	102	+1
Valvoline Oil 7s '37	104¼	104	104	0

New York Bonds

Week Ending Nov. 30

	High	Low	Last	Ch'ge
Assoc. Oil gold 6s	102½	102⅜	102½	0
Atlantic Refg. deb. 5s	102½	101¼	101¼	—1
Barnsdall Corp. 6s	145	140	140¼	—2¾
Barnsdall Corp. 6s ex-war.	99½	97⅝	99¼	+1½
Cal. Pet. 5s	103½	103	103⅛	— ⅜
Cal. Pet. 5½s	104½	103½	104½	— ½
General Asphalt 6s	111¼	109	111½	+1¼
General Pet. 5s	101⅝	101½	101⅝	— ⅛
Humble Oil & Refg. 5s	100¾	100¼	100¼	— ⅜
Humble Oil & Refg. 5½s	102	101½	101¾	0
Mid. Cont. Pet. 6½s	105¼	105	105	0
Pan Amer. P & T 7s	104½	104½	104½	— ¼
Pan Amer. P & T 6s	107	106	106	— ½
Pan Amer. P & T 6s	99⅞	99	99¼	0
Phillips Pet. 5¼s	94¾	94⅜	94⅜	+ ⅛
Pure Oil 5½s	101	100⅝	100¾	+ ⅛
Shell Union Oil 5s	98⅞	97¾	98½	0
Simms Pet. 6s	101	101	101	+ ½
Sinclair Con. Oil 7s	104	103⅜	103¾	+ ⅜
Sinclair Con. Oil 6½s	101⅞	101	101¾	+ ¼
Sinclair Con. Oil 6s D	100¼	99½	100⅞	+ ⅝
SinclairCon.OilCrude5½s	98	97½	97⅝	— ⅛
Sinclair Pipeline	96	95¼	95¼	— ¼
Skelly Oil 5½s	94¾	94	94¾	— ¼
S. O. N. Y. 4½s	98⅛	97¾	98¼	0
S. O. N. J. 5½s	103	102¾	102⅞	+ ⅛
Union Oil of Calif. 6s A	110	109½	110	+1
Union Oil of Calif. 5s C	99¾	99½	99½	— ⅛
White Eagle Oil 5½s	107½	104⅞	106⅝	+2½

Oil Dividends

	Amount	Payable	Stock of Record
Hololulu Cons. Oil q	50c	Dec. 15	Dec. 5
do extra	50c	Dec. 15	Dec. 5
Independent Oil & Gas q	50c	Jan. 31	Jan. 15
Oil Shares q	37½c	Dec. 20	Dec. 10
Phillips Petroleum q	37½c	Jan. 2	Dec. 14
do extra	50c	Jan. 2	Dec. 14
Pure Oil 8% pfd. q	$2	Jan. 1	Dec. 10
do 6% pfd. q	$1.50	Jan. 1	Dec. 10
do 5¼% pfd. q	$1.25	Jan. 1	Dec. 10
Shreveport-El Dorado q	50c	Jan. 2	Dec. 20
S. O. Ohio q	62½c	Jan. 2	Dec. 7
Tide Water-Assoc. pfd. q	$1.50	Jan. 2	Dec. 10
Tide Water Oil q	20c	Dec. 31	Dec. 10

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